JOURNAL

OF THE

New York Entomological Society

VOL. XXXII. MARCH, 1924. No. 1

CRITICAL OBSERVATIONS IN THE MEMBRACID GENUS CYRTOLOBUS GODING. (HEMIP.-HOMOP.)

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Since the publication in 1908 of Mr. Edward P. Van Duzee's most useful "Studies in North American Membracidæ"[1] nothing has appeared of a systematic character concerning our representatives of the genus *Cyrtolobus,* other than one or two brief papers correcting or modifying certain conclusions there presented, or for purposes of local lists. Contemplating the preparation of as complete a review of this genus as might be practicable, I have devoted much time to field work and study during the past three years in an attempt to solve the many problems which have presented themselves as the work proceeded. Considerable progress has been made; but so many unforeseen difficulties have arisen, including the discovery of undescribed species in every locality visited, with the resulting presumption that our knowledge of its components is far from complete, that it has become apparent I cannot yet offer such a review as would be satisfactory. Nevertheless certain results already attained, particularly with respect to species of the eastern United States, will be of value and interest to other students of the group; so I am impelled to formulate them now, that they may be made available. It is to be hoped, however, that the preparation of such a review by a competent authority may be warranted and prove feasible within a reasonable time.

[1] Bull. Buf. Soc. Nat. Hist. IX, p. 29. (1908).

In setting forth the characters of those species which heretofore have not been recognized, as well as of the undescribed males of species of other authors, but little reference is made by me to facial outline or pronotal punctuation, due to my inability to discover sufficient stability in these characters to render them of more than questionable value in specific diagnosis. For the delineation of the species treated I have been fortunate in securing the services of Mrs. Beutenmuller. It should be pointed out, however, that the figures are intended to portray in the respective species represented only the form and pattern of the pronotum, with the character of the infuscation of the fore wings, and that neither the texture of the latter, the form of the abdomen visible in nature through their hyaline area, nor the details of coloring, vestiture and structure of the legs are intended to be indicated.

Acknowledgment is here made to the custodians of the material in the collections of the United States National Museum, American Museum of Natural History, Boston Society of Natural History, New York State Museum at Albany, and Brooklyn Museum of Arts and Sciences, as well as to Messrs. W. T. Davis, C. E. Olsen, W. D. Funkhouser, Charles S. Johnson, and Mrs. Annie Trumbull Slosson for the privilege of examining what in the aggregate proved to be a most interesting array of the forms to be found throughout the continent north of Mexico, and which also emphasized the extreme confusion of the genus so far as the recognition of described forms is concerned. To Dr. Funkhouser in particular I am indebted for most helpful criticism and discussion, both by correspondence and through charming hospitality extended to me at his most delightful home.

As it is a prerequisite to a correct understanding of the genus that those species already described be certainly recognized, I shall not only present my conclusions with respect to the identity of those regarding which there seems to be any confusion, but somewhat in detail the steps by which I have reached such conclusions.

The order in which my consideration of the several species is presented conforms for the most part to that followed in Van Duzee's List of the Hemiptera of America north of Mexico, such comparatively few departures or transpositions as I have made

in the sub-genus *Cyrtolobus* s. str. being in the interest of what seems to me a closer approximation to their natural sequence from the species in *Archasia* and *Smilia* to those in *Atymna*.

Cyrtolobus ovatus Van Duzee.

Cyrtolobus ovatus Van Duzee was described from female specimens only. Its color, given as "soiled yellowish testaceous" in the dried specimen, is accurate for the living specimen as well; but occasional examples are taken that are pale green. There is frequently present, too, a sub-obsolete anterior oblique vitta, with more or less obscure indications on the dorsal carina of the translucent spot and anteapical vitta. Its deflexed posterior pronotal process fully attains the apex of fore wings. The male, hitherto undescribed, seems to be of two color forms, one black and the other pale brownish. The latter may be described as follows:

Cyrtolobus ovatus Van Duzee. (Plate V, Fig. 41.)

MALE: Pronotal arch much less arcuate than in the female, only slightly deflexed at tip and attaining only to middle of terminal areole. Mid-dorsal compression deep and very pronounced. Color light brown, somewhat shining, becoming a little reddish back of anterior oblique vitta. The latter is white, arises from middle of lateral margin and curves forward only about half way to crest. Translucent spot at mid-dorsal carina small. Anteapical white vitta complete, vertical, prominent.

Body beneath pale.

Fore wings sub-hyaline, slightly clouded at terminal margin.

Legs pale, femora above a little darker.

Length 4 mm.

Allotype ♂. Lakehurst, N. J. VI/17/'17. In my collection. Taken on *Quercus ilicifolia*

This brown form I have taken, probably while copulating, with a female from a very small sapling of *Quercus minor* at Hazen, Alabama, the sapling so small it could hardly have harbored another species. The black form, also taken at Lakehurst, N. J., and in the south, is the counterpart in form and markings of the brown one, jet black replacing the brown, including the body beneath and femora above, the black throwing into greater relief the white vittæ. The brown male is here figured.

Cyrtolobus arcuatus Emmons.

Cyrtolobus arcuatus Emmons is one of the least abundant species in the genus, though occuring both north and south in the eastern United States. Emmons's published figure shows well the form of the female, though of rather unusual coloring, the nearest approach to which that I have seen is a specimen from Massachusetts in the C. W. Johnson collection. A series of nine female specimens taken by me in Alabama range from no vitta to a strongly marked anteapical whitish vitta, quite broad, bordered anteriorly with a narrow dark band, sometimes rather rufous; the pronotum otherwise brownish testaceous, three of them peppered with black anteriorly and along dorsal crest. At Yaphank, Long Island, N. Y., I have taken four other females similarly marked, but much more contrastingly, the anteapical vitta broadly white, bordered both before and behind with narrow dark bands. At the latter locality four male specimens have been taken; in the American Museum of Natural History, New York City, is one from Berkley Heights, N. J., collected by the late E. L. Dickerson, and in the National Museum is one from Maryland, all of which I unhesitatingly place as males of this species. Hitherto the male has been unknown, and these six specimens are all I have seen. A description of that sex is as follows:

Cyrtolobus arcuatus Emmons. (Plate I, Fig. 3)

MALE: Pronotum arching moderately, very slender, no anteapical sinus, tip slightly deflexed as in the female, and almost attaining apex of fore wings.

Color dark testaceous, thickly irrorate with black on metopidium and forward part of pronotum. Anterior oblique pale vitta broad, the middorsal translucent pale spot equally broad, directed from crest to bottom rearward and reaching that vitta at its middle. Immediately back of this translucent spot, only narrowly separated from it, commences an even broader anteapical vitta, inclined strongly rearward from dorsal to lateral margin, generally paralleling the direction of the elongated translucent spot.

Body beneath dusky.

Fore wings hyaline; apical border infuscated.

Legs yellowish testaceous, shining.

Length 5.8 mm.

Allotype ♂, Yaphank, Long Is., N. Y. VI/9/'12 (W. T. Davis), in my collection.

Accompanying the figure of the male specimen above described is appended that of a female (Fig. 4) taken by me at the same locality June 15, 1923. It will be noted that its anteapical vitta has an inclination approaching that of the male, though not so pronounced—an inclination not found, at least in similar degree, in any other species of the genus known to me. While the male has not yet been taken in copulation, I have no doubt that the specimens above described are correctly assigned to this species, by reason of their corresponding general facies.

Cyrtolobus fuliginosus Emmons.

In 1854 Emmons figured a species of *Cyrtolobus,* with a very brief description,[1] under the name *Cyrtosia fuliginosa.* There seems to be no confusion as to its identity—very dark, the markings often obscured, with a distinctive pronotal structure, its apex, slightly deflexed, almost or quite attaining that of the fore wings, with a slight anteapical sinuation usually faintly indicating a clear spot on the dorsal carina. The mid-dorsal translucent spot, however, is lacking. Such is Emmons's *fuliginosus* of the female sex. It is frequently almost black. Occasionally, however, specimens are found that show on this blackish surface more or less evident markings, including the pale oblique vitta which occurs so often throughout the genus; but almost always the anteapical vitta is lacking. From these it is but a step to still paler specimens through various shades of brown, reddish and pink. The latter forms are found much more frequently than the blackish unmarked ones, though in the same localities, and in almost all collections to which I have had access they bear names of various species assigned to this genus, but in no case that of the species figured by Emmons above referred to. The specimen in the Harris collection at the Boston Society of Natural History Museum which bears Say's identification as his *vau* is one of these pale forms. In structure, however, they seem to me absolutely indistinguishable from that of *fuliginosus* Emm., and I have no doubt that these paler forms are of the same species.

Its distribution seems to be general throughout the eastern United States. In Alabama I have found the reddish or pinkish

[1] Nat. Hist. of N. Y., Agri. V., p. 154; Plate 13, Fig. 15.

form to the exclusion of the blackish one; and there succeeded in getting a pair in copulation, thus definitely ascertaining the identity of the male of this species, hitherto not positively known. Figures of this pair are presented with this paper, the male of which is described below in detail and designated as the allotype of the species. It will be noted that this male is prevailingly black, as are some twenty other specimens of this sex collected with these reddish females in the same locality. Four reddish males in my collection, also taken with them, as well as similar specimens examined by me from various parts of the country, north and south, I regard as the same species; and as the blackish male is found with the reddish female, even copulating with it, not even racial standing can be given the conspicuously different color phases found in both sexes of this species.

Cyrtolobus fuliginosus Emmons. (Plate II, Figs. 13, 14.)

MALE: In form like the female, but smaller, the low and slender pronotum not attaining apex of fore wings.

Face deep, margins of genæ rounded so that contour of face is almost semicircular, with clypeus very little produced.

Metopidium rising vertically from base in a plane with and exceeding in height that of face, thence abruptly back at an interior angle of about 120° to the summit of the crest forward of middle, with a very slight sinus over humeri, thence sloping to apex, which barely exceeds basal angle of terminal areole of fore wings, a strong but hardly translucent mid-dorsal compression, and a slight sinus at anteapical vitta. Face, metopidium and whole of pronotum anterior to oblique vitta black densely irrorate with pale testaceous. Anterior oblique vitta whitish testaceous, arising at the side margin back of the middle, arching gradually forward to above post-humeral sinus and thence rising abruptly and vertically to dorsal carina. The posterior vitta vague, vertical, whitish testaceous interrupted by the brownish black pigment of the pronotum, which is almost uniform back of the anterior vitta except where crossed by this posterior vitta. Mid-dorsal compression slightly reddish.

Body beneath black, abdominal ventral segments pallid.

Fore wings slightly enfumed, not so much as in the female, margin narrowly fuscous.

Legs pale testaceous.

Length 5.20 mm.

Allotype ♂, Hazen, Ala. IV/6/'21. In my collection.

The above described male was taken with a female *in copula* on *Quercus rubra*. Specimens of this sex before me range from almost wholly black to those in which the black pigment is greatly reduced. There seems to be no intergradation, however, between the blackish forms and those in which pink or red replaces the black. In all the forms the anteapical vitta in this sex is usually pronounced, often extremely broad; in the reddish form it shows a greater tendency to be obsolete as in the female.

Cyrtolobus acuminatus new species.

The following new species is one that should be recognized readily when found by its contrasting whitish and red pronotum with its acuminate posterior process. In an orderly arrangement of the genus it perhaps finds its place near *fuliginosus* Emmons, though not so decidedly arcuate, the form of its pronotum, particularly as respects the often decurved apex, closely corresponding in that feature with the figure of that species given by him. But it is a little longer and proportionately lower, with more pronounced anterior sinus, and even brighter colored than the pale forms of that species, and its posterior pronotal process is decidedly slender and acute. Its supra-humeral bands suggest those of *discoidalis* Emmons; but, unlike that species, they do not extend down over the face, and the oblique vitta, though bordered behind at the lateral margin with black, does not extend so far to the rear. Its larger size, reddish posterior half, pale femora and strongly enfumed fore wings also distinguish it. The arch of the crest and attenuate pronotal apex recall *fenestratus;* but here again it is much larger, the arch between the carinal sinuses is not so abrupt, the mid-dorsal translucent spot is only slightly pellucid, the pronotal apex is usually definitely deflexed, and the strongly enfumed fore wings with their broad apical cloud are divergent characters. Figures of both sexes are herewith presented, and their description follows:

Cyrtolobus acuminatus, new species. (Plate VI, Figs. 47, 48.)

FEMALE: In size rather above the average; colors contrasting, creamy white anteriorly, red posteriorly; arch pronounced between anterior and posterior sinuses, apex of posterior process attenuate, usually decurved, no anteapical vitta, clypeus plainly produced, fore wings strongly enfumed.

Face creamy, shining, small punctures reddish brown, clustered adjacent to eyes and on front, spots at base above ocelli elongate vertical; clypeus with sutures strong, loræ outlined with reddish without and within, clypeus centrally strongly produced below line of cheeks at least as far again as length of loræ, seemingly variable in width, tending to comparatively narrow, very little incurved.

Pronotum rising vertically in plane of face about twice as high as is middle of post-humeral sinus, thence rounded back almost horizontally to above humeral angles, where it begins a pronounced arch to posterior sinus. its highest point before middle. From the latter sinus the posterior process is attenuate, prolonged, very sharp at its apex and usually, but not always, rather strongly deflexed, attaining or exceeding apex of terminal areole of fore wings. Punctures of surface back of oblique vitta are large and deep, the surface reticulate. Metopidium and pronotum anterior to oblique vitta creamy white, with narrow reddish brown bands arising at black or red callosities above eyes and surpassing humeri, but more or less lost thereafter. Oblique vitta rising from lateral margin just back of mid-dorsal translucent spot to a point a little anterior to that spot, its rear margin surpassing its base, thence horizontally forward to above posthumeral sinus, where its rear margin often turns abruptly to carina, its front margin reaching carina at anterior sinus. The anterior margin of this vitta is very poorly defined, except at the lateral margin of the pronotum, by reddish punctures much interrupted by the cream colored surface of the forward parts. The vitta itself is cream colored, extends narrowly forward along lateral margin, and is bordered behind by the red of the posterior surface of the pronotum, along its lower half by darker red tending to blackish. The crest is very narrowly thinned back of anterior sinus and along posterior sinus, with a strong mid-dorsal compression containing a deeper than wide pellucid spot, on either side of which the carina is narrowly blackened. The anteapical vitta is lacking.

Body beneath black anteriorly, abdominal segments pale testaceous, the ninth bordering the ovipositor washed with red.

Fore wings sub-hyaline, strongly enfumed, the corium dark red to black, apex a little more intensely infuscated, covering terminal areole and half of adjacent cells, the anterior margin of cloud indefinite.

Legs pale testaceous, including femora.

Length 6.50 mm.

MALE: Like the female, but much smaller; in the allotype the clypeus is narrow and even more produced, exceeding the loræ by about twice their length, and is very hairy at its tip. Supra-humeral bands faint; posterior process of pronotum attenuate and very sharp, but not at all deflexed, attaining middle of terminal areole of fore wings. In a specimen cited below, whose coloring may prove to be the prevailing one, the cream and red of the pronotum are largely supplanted by black, with the pronotal apex white.

Body beneath, legs and fore wings as in female.
Length 5.60 mm.

Holotype ♀. Pine Island N. Y. VI/19/'12 (W. T. Davis), in Davis collection.

Allotype ♂. Taken with holotype. In my collection.

Paratypes: Four females, taken with types, and a male and five females taken in northern New Jersey (E. L. Dickerson) in Coll. Am. Mus. Nat. Hist.

A male at hand from Berkley Heights, N. J. (VI/9/—), resembles in coloring, but not in form, the male of *muticus* Fab. in the sub-genus *Xantholobus*. Its face, base of metopidium, and shoulders are yellowish white, with black on front of metopidium from a little above base, filling in space between humeral bands, which are obliterated, and area between narrow pale lateral margin and oblique vitta, and also back of that vitta to posterior sinus, replacing red of allotype. Its posterior process is wholly creamy white, and its fore wings are clearer, though somewhat enfumed.

Thus far I have seen examples of this species from New York and New Jersey only, twelve in all. But that should not necessarily be taken to mean that it is rare; more likely that it is extremely local in its distribution. The female holotype is perhaps a little below the average in length, one specimen before me measuring 7.10 millimeters; and the posterior process of the pronotum is usually decidedly decurved, much more so than is shown in the figure given herewith. Its size and general color and pattern at once suggested to me Fairmaire's description of *sculptus,* ever present in my mind; but the absence of "two almost transparent dorsal spots" and its strongly enfumed fore wings bar it from that identification.

This species well exemplifies what seems to be the very plastic state of this genus, with the consequent difficulty in finding structural characters that in themselves will serve definitely to fix a species; for instance the clypeus of the female, here usually long, narrow and much protruded below line of cheeks, is in one specimen comparatively broad and but little protruded. And the degree of deflexion of the pronotal process from zero to extreme is another instance. The comparatively large size, creamy white

forward parts, and general facies, all serve to mark it out as distinct from other described species.

Cyrtolobus dixianus new species.

The following species, not heretofore recognized, in the female suggests *arcuatus* Emm., with which I have found it associated on its host plant, but it is at once distinguishable in the field by its green rather than grayish or testaceous color, and more particularly by its more moderate pronotal arch without apical sinus, and by the entire lack of the broad white anteapical vitta with its anterior reddish brown border, more or less pronounced in that species. The male is wholly dissimilar. Descriptions and figures of both sexes are herewith presented.

Cyrtolobus dixianus, new species. (Plate I, Figs. 5, 6.)

FEMALE: Much the form of *arcuatus* Emmons, but a little smaller The acute posterior process of its pronotum, while reaching at least to apex of terminal areole, does not attain the apex of the fore wings as in that species. Color light green throughout; some specimens in life more or less washed with bright yellow, particularly on face and metopidium centrally and over humeri, and on sides of abdomen. As usual with green insects, this color often undergoes a change in drying specimens, becoming on the pronotum a tan shade which more or less completely, though rarely entirely, usurps the original green, and on the face and softer parts tends toward a pale yellow.

Face between eyes but little broader than long, margins of genæ strongly sinuate, again incurving to the distinct clypeal sutures, their outline therefore not continuous with that of clypeus; the latter very slightly inflexed, moderately produced and rounded. Eyes green, centrally reddish brown.

Pronotum moderately arched, highest just before middle, carina curving evenly without sinuses to apex, where it meets the rectilinear side margins undeflexed; the whole crest bright green, flecked with small pale green or white impunctate spots becoming creamy white in dried specimens. and covered inconspicuously with fine, erect and sparsely placed hairs. Punctuation not very coarse, punctures regular in size, evenly and fairly densely distributed.

Body beneath green.

Fore wings hyaline, their veins greenish and distinct; apex immaculate.

Legs green, claws rosy.

Length 7.5 mm.

MALE: Form similar to that of female, but arch much less pronounced; punctuation coarser and sparser, and surface consequently more shining.

Face green.

Pronotum anteriorly, including metopidium and forward part of crest, covering humeri and running diagonally to middle of lateral margins. bright green; back of this the crest is creamy white, with brown as follows A small blotch on carina just forward of middle; a broad band from behind middle of dorsal carina running vertically to lateral margin; and another covering apex—the whole pronotum with the white flecking spots seen in the female.

Body beneath bright green. Tergum of abdomen black, the black in some specimens invading the green of the ventral segments. Genital organs black.

Fore wings hyaline without fuscous apical cloud, as in female; brownish coriaceous at extreme base.

Legs bright green.

Length 6.5 mm.

Holotype ♀. Hazen, Ala. IV/9/'21. Taken on *Quercus minor.*
Allotype ♂. Same locality, date and host plant. Both in my collection.
Paratypes: Nineteen males and thirty-eight females. Same locality.

The holotype and allotype were taken by me *in copula* by beating *Quercus minor.* Five of the paratypes were beaten from *Quercus phellos,* the rest from *Quercus minor,* the latter evidently the preferred host plant. In the National Museum collection is a female specimen from Maryland, in Dr. Funkhouser's collection one from Rochester, N. Y., which seem to be this species. and in Mrs. Slosson's collection is a pair taken in copulation at Delaware Water Gap, Pa. In Alabama I have found this species in comparative abundance on its host plant (supra) from April 5 to 13, 1921, and April 23 to May 4, 1923; and many more females might have been captured easily. Not so with the males, however. That sex was the most agile *Cyrtolobus* I have ever endeavored to cover with my hand in the inverted umbrella; and for several days upon first encountering them I despaired of securing a single specimen, as they took to flight almost instantaneously upon touching its surface. In 1923 they proved to be much less abundant in the type locality than in 1921; but the season was unusually late and cold, which doubtless accounts for their scarcity in that year

Cyrtolobus celsus Van Duzee.

Cyrtolobus celsus Van Duzee belongs to the strongly arcuated group in the genus, and was described by Van Duzee in his "Studies" under Fitch's name *fenestratus,* as subsequently pointed out by him. It was founded upon three females, one from Georgia, another from Massachusetts, and the third from Staten Island, N. Y. The latter is now before me. In my judgment the northern examples are specifically separable from those of the south, and of the three examples above mentioned that from Atlanta, Ga., should alone be regarded as the type of *celsus.* The structural characters which seem to me most distinctive are an extreme hairiness, the pronotal arcuation high above humeri, not retreating or with suggestion of anterior carinal sinus, a pronotal swelling back of upper part of anterior vitta and another before the posterior vitta, present in both sexes but in varying degree, with the mid-dorsal compression anterior to the latter a deep rounded pit. It seems to be far from common, and comparatively few undoubted males have been noted; none taken in copulation. As that sex has not been described, a characterization is here presented, based upon a specimen taken this past season in Alabama in a locality in which females were also taken.

Cyrtolobus celsus Van Duzee. (Plate II, Fig. 9)

MALE: Shining, hairy, more densely on face and metopidium. Pronotum evenly arched from base to summit before mid-dorsal translucent spot, its outline on metopidium exceeding plane of face, sinuate at translucent spot and anteapical vitta, barely attaining basal angle of terminal areole of fore wings.

Face mottled brownish testaceous, with inner margins of loræ dark brown.

Metopidium similarly colored, vague brownish bands from basal callosities above eyes running over humeri, punctures black. Coarse punctures of pronotum thickly interspersed with fine setæ-bearing punctures, the hairs three to four times as long as the diameter of the coarse punctures; compressions at anterior, mid-dorsal and anteapical pale spots strong and deep, the pronotum conspicuously swollen between them on either side of the mid-dorsal translucent spot. Oblique anterior vitta arising from middle of lateral margin, directed toward but not quite reaching base of mid-dorsal translucent spot, thence vaguely forward to above post-humeral sinus where it turns abruptly and broadly upward to dorsal carina. This vitta is broadly bordered posteriorly with dark brown, back of which the

pronotum is an umber brown, with narrow and deep white mid-dorsal translucent spot and vertical anteapical vitta.

Body beneath black, abdominal segments pale.

Fore wings hyaline, a dark fuscous cloud on terminal boarder encroaching on apical areoles.

Legs pale testaceous, femora above black.

Length 5 mm.

Allotype ♂. Hazen, Ala. V/4/'23. In my collection. Taken on *Quercus minor.*

A male specimen in the Funkhouser collection, taken at Southern Pines, N. C., corresponds with the above described allotype except that its coloring is prevailingly dull reddish. A female taken at Lakehurst, N. J., a region noted for the southern aspect of its fauna, is the most northern record I have seen for this species. In general it is of medium size, has a rather chunky appearance, with the high arch of the pronotum particularly full in front, and its surface characterized by unusually long and abundant setæ more or less erect, but confused in direction by the abrupt and irregular undulations of its tuberous surface. *C. clarus,* described in this paper, is also recalled by the deep and narrow mid-dorsal translucent spot; but in this species, as already pointed out, the pronotal arch is devoid of any suggestion of anterior sinus, is more roughly reticulate on the sides in the female, lacks the extended and deflexed pronotal apex of *clarus,* and is characterized by the posterior tuberosity of the pronotum above referred to. A figure of a female of this species is appended hereto on Plate II, Fig. 10; and the northern form so frequently confused with it is next considered.

Cyrtolobus funkhouseri new species.

The females of the following new species have a strong superficial likeness to those of *C. celsus* Van D., with which they are commonly confused. They particularly resemble that species in size, general form of the pronotum, and somewhat in detail; so that upon a more or less casual examination they would be ranged together. Indeed it was not till the evidently diverging characters of the males were noted, precluding their association, that those of the females, largely comparative though they be, were recognized as amply sufficient to distinguish them from *celsus.*

Briefly, the absence of the long, dense, erect hairiness of the pronotum is in itself adequate for the separation of this species from *celsus;* and from *vanduzei,* which it also closely resembles, it is at once distinguished by the abruptly incurved clypeus, not protruding conspicuously below the line of the cheeks in frontal view as in that species and in *celsus,* as well as by its somewhat smaller size. The following detailed description of the two sexes will serve to indicate other points of divergence.

Cyrtolobus funkhouseri, new species. (Plate II, Figs. 11, 12.)

FEMALE: Medium in size, moderately hairy, hairs short, punctures of pronotum shallow, surface smooth, somewhat shining. Color dingy reddish brown, paler anteriorly, with usual vittæ and pellucid spots.

Face creamy white, smooth, sparsely and finely punctured with light reddish brown, more densely next to the eyes, much broader than long, the line of the cheeks continued by clypeus, which in front view is not produced below them, and in side view is seen to be strongly reflexed.

Pronotum with metopidium pale brown more or less mixed with cream, darker reddish brown bands rising from callosities above eyes to summit, but not passing over humeri; anterior oblique vitta creamy, back of which the pronotum is a darker reddish brown interrupted by mid-dorsal translucent spot and anteapical vitta. Punctures of metopidium twice as large as those of face, about half as large as those of pronotum back of humeri. Erect hairs of face and pronotum not twice as long as diameter of the large shallow punctures of sides of pronotum. Arch rather high, usually slightly retreating over humeri to a slight sinus indicated on carina before humeri and anterior to crossing of oblique vitta, and thence rising and arching evenly to posterior apex, with more rarely a slight sinus at crossing of anteapical vitta; its posterior process reaching to middle of terminal areole of fore wings. The anterior oblique vitta runs from above humeri back almost horizontally to a junction with the elongated mid-dorsal spot, and thence abruptly but obliquely down to lateral margin, reaching it, somewhat expanded, well back of posterior margin of mid-dorsal spot, and thence it runs forward narrowly along margin to base exterior to eye. Anteapical vitta vertical, broad, expanding on dorsal carina. Mid-dorsal translucent spot conspicuous, longer than wide, compression wide and deep; crest also compressed at crossing of carina by anterior oblique and anteapical vittæ, somewhat bulbous between the three compressions but not so much so as in *celsus.*

Body beneath testaceous.

Fore wings hyaline, washed with flavous, coriaceous at extreme base with usual punctures, tip slightly cloudy with apical cells a little invaded.

Legs testaceous.

Length 5.50 mm.

MALE: Like the female, smaller, strongly shining, red (in allotype and other examples) or black, the broad bands above callosities of metopidium continued over humeri to fill space between lateral margin and oblique anterior vitta; carina at base marked with blotch of red or black, which is repeated immediately anterior to the crossing of the oblique vitta. The pale vittæ and markings are whiter and more clearly defined than in the female, the deep mid-dorsal translucent spot apparently continued to pronotal margin by its junction with the inferior half of the abruptly deflexed oblique vitta, these markings having the effect of white bridle-reins and girth on the dark insect.

Body beneath black.

Fore wings hyaline, clearer than in female, with darker narrow terminal cloud.

Legs testaceous, femora above black.

Length 5. mm.

Holotype ♀. Litchfield, Conn. VI/30/'23. In my collection. Taken on *Quercus rubra*.

Allotype ♂. Yaphank, Long Island, N. Y. VI/15/'23. In my collection. Taken on *Quercus coccinea*.

Paratypes: A male and two females, Central Park, L. I., N. Y., and females from Litchfield, Conn., and Delaware Water Gap, Pa., in my collection; two males from Canada and one from Indiana in Nat. Mus. coll. A male from Lexington, Mass., and a female from Bedford, Mass., in Funkhouser collection; a male from Yaphank, N. Y., and females from Massapequa, Long Island, and Staten Island, N. Y. in Davis collection; and a male and two females from Bay Shore, Long Island, and four females from Yaphank, Long Island, N. Y. in Olsen collection, and one from Summit, N. J. (Dickerson) in Am. Mus. Nat. Hist. coll.

This species, in spite of its generally close resemblance to *celsus* in the female, is quite easily separated from it by two of the characters above pointed out, to-wit, the erect hairs of the pronotum, in this species not long nor very dense, those over the humeri less in length than twice the diameter of the lateral punctures of the pronotum, while in *celsus* their density is conspicuous and in length they exceed the diameter of the larger pronotal punctures from three to four times; and the other character is the clypeus, which is short, not exceeding line of cheeks, but abruptly incurved, whereas in *celsus* it plainly protrudes below the line of cheeks and is hardly at all incurved. Other differences are in the shallower pronotal punctures of this species, and its comparatively smooth surface, contrasting with the deeper punctures and

almost reticulate surface of *celsus,* the less forward arching of the pronotum here, with an anterior sinus usually indicated, while in that species there is rarely a suggestion of sinus; nor are the compressions at the pale spots of the crest, though marked, so deep as in that species, with its consequent greater bulbosity of the pronotum before and behind the mid-dorsal translucent spot. Furthermore, the oblique vitta in *celsus* meets the lateral margin further forward than here, rarely further back than the hind margin of mid-dorsal translucent spot; and again the fore wings of *celsus* are a much clearer hyaline. In the male the almost smooth and shining surface of pronotum without the strong swellings, and the much sharper definition of pattern, will serve to distinguish it from that sex of *celsus,* the vittæ being broad and clear, and together with the mid-dorsal spot often equalling the dark area of the rest of the pronotum.

An examination of the Staten Island example of the three specimens upon which *celsus* was founded shows it to belong here, as doubtless does the specimen from Massachusetts cited in its description; in fact, all specimens of this species which I have seen were taken in the north, while *celsus* seems to be primarily a southern species. The preferred host plant is not known, at least four species of oak having been found to harbor it.

Cyrtolobus vanduzei Goding.

This is a southwestern and Pacific coast species found in great abundance on the western live oak, and as at present understood is subject to great variation in form and color, especially remarkable in the males. From my experience with other members of this admittedly variable genus the suspicion presents itself that there may be confusion here; and it is recommended that the guests of that host be carefully studied with particular attention given to the mating of the several forms, and that the results of that study be published.

Cyrtolobus clarus new species.

The following is a distinct species hitherto undescribed, and, so far as known at present, occurs only in our southern states. In Alabama I have found it one of the earliest species to reach

maturity, and the females at least to be fairly abundant. Figures of both sexes accompany this paper, and their description follows:

Cyrtolobus clarus, new species. (Plate II, Figs. 15, 16.)

A medium sized species, strongly recalling in form *C. fenestratus* Fitch, but with pronotum grayish rather than red, higher posteriorly at carinal sinus, and less attenuately produced apically.

FEMALE: Face between eyes about as broad as long, testaceous, punctures blackish at inner margins of eyes and outer margins of genæ and loræ. Clypeus narrowly produced, its sutures blackish, distinct. Ocelli much nearer to each other than to the eyes.

Pronotum granulate-punctate, little elevated arching between white anterior and posterior sinuses, thence prolonged in an acute apex which almost reaches that of fore wings. Metopidium at base between and including callosities narrowly brick red. On either side of the dark brown carina it is pale brown or testaceous. Externally of and next to this a very dark brown, or in some specimens reddish, narrow band rises from basal red margin over humeri to a point below anterior carinal sinus, where it abruptly terminates. Beyond the dark band and covering humerus to above post-humeral sinus the surface is yellowish testaceous, through the middle of which runs an obscure reddish band. Anterior oblique vitta white, slightly angled at its middle, runs from anterior carinal sinus to pronotal margin two-fifths from humerus, where sometimes it is slightly expanded forward; and the anteapical vitta runs from posterior sinus directed forward to margin two-fifths from apex. The anterior vitta is bordered in front, at least on its lower half, by a narrow reddish brown line, and in the rear by a black line sometimes as broad as itself. Between these vittæ at dorsal compression is a rectangular deeper than wide translucent spot on a reddish ground color, which latter likewise covers apex.

Body beneath flavo-testaceous.

Fore wings hyaline, with a slight flavescent wash; tips with moderate infuscation, encroaching on terminal areole.

Legs yellowish testaceous.

Length 5.60 mm.

MALE: In form and pattern like the female, but a little smaller; the dark punctures on the ground color giving it a more decided grayish effect.

Face testaceous yellow, coarsely and closely covered with black punctures. Eyes dark brown.

Pronotum reaching to a point vertically above base of terminal areole of fore wings. Anteriorly it is dark brown, testaceous toward humeri, coarsely granulate-punctate with brown and black punctures, giving it an irrorate grayish appearance, the dark punctures somewhat obscuring the anterior oblique white vitta. The reddish of the remaining surface in the

female is replaced by brownish black, the mid-dorsal squarish translucent spot and anteapical vitta distinct.

Body beneath black, genital segments flavescent, organs black at tip.

Fore wings clear hyaline, veins flavescent, tips margined narrowly with fuscous.

Legs pale.

Length 4.75 mm.

Holotype ♀. Hazen, Ala. IV/4/'21. In my collection.

Allotype ♂. Same locality and date. Also in my collection.

Paratypes: Seven males and forty-two females. Same locality IV/4-20/'21, & '23.

The holotype and allotype were taken on *Quercus digitata,* and the paratypes on *Q. prinus, rubra, digitata* and *minor* growing in a row along a road. No pair was taken certainly in copulation, though one pair was knocked off together; but they were taken from the same trees at the same time (the males only about one to six females), and the general form and pattern of these males shows such marked similarity to that of the females, that I feel no hesitation in holding them to belong to the same species.

In addition to those taken by me in Alabama, I have seen a female specimen from Orlando, Fla., in the Funkhouser collection, and a large series of both sexes from Louisiana in the Baker collection at the United States National Museum.

The bands over humeri suggest *C. discoidalis* Emmons, but in this species they are usually much less extended, and there is a third dark band between them, more or less developed and covering the metopidian carina. Perhaps its most characteristic mark is the (usually) narrow and deep mid-dorsal translucent spot. It is at once distinguished from both *fenestratus* and *discoidalis* by the conspicuously granulate appearance of the metopidium and pronotum in general, by the point of incidence (or origin) of the anterior oblique vitta on the lateral margin, being here well forward of the middle, and by the presence of the broad apical vitta, which here extends undiminished to the lateral margin. Inasmuch as no undoubted specimen of Say's widespread species *vau* has been seen by me from this locality, and on the possible supposition that this might be a form of that species, I have compared the two, and it is apparent that there can be no confusion between them. They are plainly distinct. From *vau*

it is distinguished by the greater arcuation of the pronotum and its much more pronounced apical sinus, by the greater production of the pronotal apex, which in *vau* barely reaches as far caudad as the basal angle of the terminal areole of the fore wings, the narrower than deep mid-dorsal translucent spot, the irregular posterior black border of oblique vitta, and the presence on the fore wings in the female of a terminal cloud. It also lacks the almost rectilinear lines which in *vau* usually characterize its pronotal carina from summit immediately back of the incidence of the anterior vitta percurrently to apex, and also in the posterior border of that vitta.

Cyrtolobus fenestratus Fitch.

The types of the female and male of this species are in the State Museum at Albany, N. Y., so no doubt can be entertained as to the identity of the insect upon which Dr. Fitch founded this genus under the preoccupied name *Cyrtosia,* for which Dr. Goding substituted its present name. Unfortunately, Mr. Van Duzee had not examined them at the time of the publication of his "Studies" (ante), so the reference to this species in that paper is erroneous, as subsequently pointed out by him (Can. Ent. 1909, p. 383). It is, in life, one of the most beautiful species in the genus, both in color and grace of outline. The female has a bright green head and body, which in the dried specimen becomes yellowish, and exhibits conspicuously the squarish window in the keel of the pronotum, the latter red, very slender, and tapering to the long, acute apex, which attains the apex of the fore wings with their narrowly but strongly clouded terminal margins. The males are by no means always black, as described, reddish ones with whitish testaceous vittæ occurring commonly. For aid in identifying males of this species, I present herewith on Plate VI, Fig. 43, a figure of a specimen of that sex; and in Fig. 44 one of a female also.

Cyrtolobus tuberosus Fairmaire.

The male of this species, while smaller and somewhat darker than the female which is generally recognized, closely parallels that sex in its coloring and markings, particularly as respects the

broad, elongate mid-dorsal translucent spot, which curves forward at the mid-dorsal compression to meet the anterior oblique vitta at about its middle. It is found on almost any species of large oak, and is one of the most abundant and best known species in the genus, presenting no difficulty in its identification. Florida examples seen by me are paler and pinker than those found in the north, but are otherwise typical.

Cyrtolobus grandis Van Duzee.

This rather large species has a crest somewhat like, though lower than, that of *C. tuberosus* Fairm., and is notable for the long and slender apical process of its pronotum. Its habitat is in our southwest.

Cyrtolobus discoidalis Emmons.

Considerable confusion seems to prevail respecting the identity of *Cyrtolobus discoidalis* Emmons, and I am by no means satisfied that the species usually passing for it in collections should bear that name. Van Duzee, with admitted hesitation, recognized in the "Studies" three specimens possessing shoulder bands as being probably examples of the species inadequately described under this name. One of them, a female in the Cornell University collection, seems to have been the basis of his more detailed description, at least it agrees closely with it, in which he notices the lack of correspondence between its oblique vittæ and those represented in the figure given by Emmons. Other discrepancies are to be noted. For instance, in the species represented by the Cornell example the anteapical vitta is obsolete and often entirely lacking, whereas Emmons describes and figures that vitta as plainly marked, though apparently dull in color. The figure in outline also shows the pronotal apex exceeding the terminal cells of the fore wings and almost attaining their apex, an extension of the pronotum which I have not seen closely approached by any specimen of this species. I might suspect from Emmons's figure that it was drawn from a specimen of *vau* Say as here recognized, though in that species the supra-humeral bands are rarely so pronounced as there indicated, and in outline it attains its highest point more forward than shown in his outline drawing. It is

significant that one of Van Duzee's three specimens above referred to, that in the Davis collection from Sparta, N. J., is evidently an example of *vau* Say. Nor does Emmons's brief description bar out that species, drawn admittedly from a cabinet specimen, and perhaps somewhat discolored. Nevertheless, his figure is far from typical of *vau,* and even though it falls short of fitting the species evidenced by the Cornell specimen, I deem it best for the present to continue to apply to the latter Emmons's name of *discoidalis;* influenced perhaps by the supra-humeral bands, not referred to in his description, and present in many other species in the genus, but well indicated in his drawing, and in this species very conspicuous, sweeping in a rather narrow but pronounced band from near margin of genæ across face at inner edge of eye, up over metopidium and shoulder, thence vaguely back, becoming evanescent over post-humeral sinus, sometimes merging in the dark area immediately anterior to the pale oblique vitta. This vitta is unusually broad at its marginal origin, so that its posterior border is well back of the middle. It is bordered anteriorly with a narrow blackish brown band more or less interrupted at its middle, and posteriorly with a very conspicuous similar dark band rising broadly from lateral margin and becoming attenuate superiorly. The character of this oblique vitta at the lateral margin, broadened and extended far to the rear, and conspicuously bordered in front and behind with dark brown or black, is, with the supra-humeral bands, diagnostic. Briefly characterizing it further, it is, in the female, a medium-sized yellowish testaceous species with dark irregular lines streaming rearward, the pronotum arching moderately with a rather obscurely pellucid mid-dorsal compression, a pale spot at position of anteapical sinus, which is otherwise hardly indicated, the anteapical vitta obsolete, and pronotal tip not attaining apex of fore wings, which are strongly enfumed, their terminal areoles broadly infuscated. The male seems never to have been described. Several examples have been taken by me, two with females in copulation. A figure of one of these, the description of which follows, as well as a figure of a female, accompany this paper.

Cyrtolobus discoidalis Emmons. (Plate VI, Figs. 45, 46.)

MALE: In general like the female, but a little smaller.

Face pinkish testaceous; clypeus hardly produced.

Pronotal margin from base above eye over humeri to junction with lateral origin of oblique vitta broadly whitish testaceous. Dark brown supra-humeral bands extending broadly rearward, filling in the space between testaceous margin and oblique vitta, the latter arising from lateral margin far to the rear, and bordered with black as in the female. Pronotum otherwise reddish testaceous, becoming darker red between oblique and broad white anteapical vittæ, the latter curving slightly forward and almost meeting origin of anterior vitta on lateral margin. Back of posterior vitta black. Mid-dorsal pellucid spot squarish and pronounced.

Body beneath black.

Fore wings slightly enfumed, broadly dark fuscous at apex.

Legs pale, femora above black, polished.

Length 5.65 mm.

Allotype ♂. Litchfield, Conn. VI/23/'20, in my collection. Taken on *Quercus rubra,* in copulation with female.

As is not uncommon with males in this genus, many are found with the pronotum wholly black or dark red except for the whitish anterior lateral margin, oblique and anteapical vittæ, and pellucid mid-dorsal spot. Is these, where the humeral bands are merged in the ground color, the position and shape of the marginal origin of the anterior oblique vitta proves the most useful diagnostic mark.

Cyrtolobus auroreus new species.

The following is a rather scarce species, judging from the paucity of examples thus far discovered; but it is one of the loveliest in coloring, particularly in the female, where in life clear green and pink are charmingly contrasted. It is a little above the average in size, and easily distinguished in that sex by the unusual character of the pronotal markings, which radiate from the lateral margin in widening streamers of alternate pale green and rose—whence the chosen name. It may be described as follows:

Cyrtolobus auroreus, new species. (Plate I, Figs. 7, 8.)

FEMALE: Face yellowish green, one-quarter to one-third broader than long, eyes rose. Clypeus hardly produced; sutures distinct.

Pronotum strongly elevated, evenly arched, highest a little forward of middle, punctuation very fine and irregular. The usual anterior sinus

between metopidium and superior arch of crest slight but evident, posterior sinus almost obsolete; apical process not at all deflexed, with a rather blunt aspect due to the lateral margin rising slightly to apex, the latter reaching, in the type, to an imaginary line erected vertically at apex of terminal areole of fore wings, in most specimens at hand barely reaching as far posteriorly as the basal angle of the areole. Color pale green and rose, as follows: Metopidium and humeri a bright light green. A broad rose band beginning on crest just back of anterior sinus, and expanding obliquely downward, reaches lateral margin at rear of post-humeral sinus, and extends along that margin to its middle. Back of this is a broader vertical green band, somewhat triangular in shape, narrowed below by encroachment of anterior rose band, and reaching lateral margin. This is followed by a second rose band descending straight to margin, another green band only one-third as wide from position of posterior sinus to lateral margin, and back of that is rose again, covering pronotal apex.

Body beneath light green; ovipositor deep rose.

Fore wings hyaline, immaculate, their terminal margins and posterior half of veins washed with rose, the anterior half light green.

Legs flavous, tarsi apically rose.

Length 6.50 mm.

MALE: Pronotum arching similarly to female, but much lower; somewhat shining, punctuation much coarser. Color black and yellowish testaceous.

Face black, margins and front deep rose.

Pronotum black, with basal margin of metopidium, humeri and post-humeral sinus narrowly outlined with deep rose. Crest black, a narrow irregular testaceous band from just back of middle to lateral margin, slightly inclined rearward in descent, the lower half of pronotum between this band and post-humeral sinus dark reddish, and a testaceous vertical band from posterior sinus of pronotal carina to lateral margin, corresponding to the apical green band of the female. Apex dark rose.

Body beneath black, ventral segments deep yellowish testaceous.

Fore wings sub-hyaline, washed with fuscous, the apical margin darker, but not maculate.

Legs yellowish testaceous.

Length 5.75 mm.

Holotype ♀. Litchfield, Conn. VI/16/'22. Taken on *Quercus alba.*

Allotype ♂. Same locality, date and host plant. Both in my collection.

Paratypes: Two males and seven females. Litchfield, Conn. All on *Quercus alba.* Also in my collection.

The holotype and allotype were taken by me *in copula,* the pronotum of the male being somewhat deformed and twisted at its apex.

This species, of an unusual pattern in the genus, seems to be rare. The only specimens I have seen, other than the few taken at the type locality, are a female taken at Newark, N. J., and a female and two males taken at Berkley Heights, N. J. (E. L. Dickerson), in the collection of the American Museum of Natural History, New York, two males taken at Pine Island, N. Y., and at Yaphank, Long Island, N. Y., in Mr. Davis's collection, two males taken at Rochester Junction, N. Y., in Dr. Funkhouser's collection, a female with a "N. J." label in that of the National Museum, and what appears to be a male of this species in the same collection, taken at Chicopee, Mass.; also a female in Mrs. Slosson's collection taken by her at Delaware Water Gap, Pa. Figures of the holotype and allotype are herewith presented, the outline of the deformed pronotal apex of the male corrected in the drawing to conform with that of another specimen.

Cyrtolobus cinctus Van Duzee.

This species is not represented in any collection to which I have had access except possibly that of Dr. Funkhouser with a non-typical female lacking the lateral black arcuate line, taken at Ithaca, N. Y., the type locality, and that of Cornell University, which contains the type female, as well as the supposititious male. The latter has been submitted to me through the courtesy of Dr. Bradley of that university, and is in my opinion undoubtedly a male of *C. fuliginosus* Emmons. In my own collection is a female taken by me at Bronxville, N. Y., which is apparently of this species. I have critically compared it with the type, with which it agrees except that the so-called anterior vitta of the original description, an arcuate narrow black line, in my specimen has its origin on the lateral margin of the pronotum further forward, over post-humeral sinus, rises vertically about half way, and then curves forward and upward to dorsal carina. Back of the upper half of this line the green pronotum of this specimen is somewhat stained with brown. Notwithstanding these differences, I believe this female and the above type specimen are of the one species. Standing side by side, it seems impossible to separate them specifically. It might be pointed out that in this genus the vittæ are pale when apparent at all, and therefore the black line in the type, although occupying a position corresponding

to that of an anterior oblique vitta, is not necessarily to be regarded as that vitta. Accordingly the more forward position of that black line in the Bronxville specimen may be significant of a variation of pattern rather than a displacement of so characteristic, though far from invariable, generic mark as the vitta in question. The capture of further examples of this species is greatly to be desired, particularly that of an undoubted male taken *in copula*.

Cyrtolobus vau Say and *sculptus* Fairmaire.

The first species assignable to this genus to be recorded from this country was taken in Pennsylvania, and was described by Thomas Say in 1831 under the name *Membracis vau*. Although the genus as now recognized and delimited to which the species as described by him belongs (*Cyrtolobus*) contains in this country many other distinct species, many of which are fairly abundant in those parts of the United States in which Say collected, it is a significant fact that, except for *C. inornata,* he never described another species assignable to it. The significance lies in its bearing on the question as to just which one of these many species we are to recognize as *vau* Say. As is well known, practically all of his types have been destroyed, including those in this family; so we are thrown back on his description, given in considerable detail, and, to supplement that, such collateral and inferential evidence as may be available. In the first place it became evident that there was no concord of opinion as to its identity, almost every collection to which I have had access having different species standing under the name *vau* Say, most of the species so assigned presumably having been found to agree substantially with the original description. That this should be true is not at all strange, as there is a prevailing type of pattern in the genus, well indicated in that description, which, while not universal, is found in a large number of distinct species, and the dimension given by Say—one-fourth inch in length—has very reasonably, though erroneously, been regarded as a general approximation. As other students had done, so I attempted to determine from material of my own collecting, irrespective of other determinations, whether any of it might be placed under that name with a colorable title to it. One species seemed preeminently to

display the requisites of Say's description, and the considerable material from our northeastern states and Canada representing this species in my collection included specimens from the state which Say said *vau* "inhabits"—Pennsylvania. But this species I had already determined as Fairmaire's *sculptus,* both from the original description and from that contained in Van Duzee's "Studies" (ante). Specimens thus labelled *sculptus* Fairm. were then sent to Dr. Funkhouser for confirmation, and promptly returned with his identification of them as *vau* Say. Notwithstanding their accord with Say's description, and the conspicuous approach in the female (the sex now under consideration) of the anterior oblique and posterior vittæ at the lateral pronotal margin, forming the character V which Dr. Funkhouser pointed out was very likely what Say intended to indicate by his specific name, the specimens in question in my opinion were undoubtedly *sculptus,* Fairm., so remarkably well did they conform to his description. In this predicament resort was now had to the examination of specimens which our entomologists of earlier generations had recognized as of this species; and learning that the Thaddeus Harris collection in the museum of the Boston Society of Natural History contained examples purporting to be *vau* Say, I next examined that. Dr. Harris was a contemporary and friend of Say, so my hopes of resolving the difficulty were high. The collection contained two specimens bearing the number 224 ♀, one of which also bore a label with the letter U in red ink. Turning to Harris's original Catalogue, the first entry of which, in what is evidently his own handwriting, is "This book was begun in 1822", the following appears on page 1 in red ink in the same handwriting:

"Note. Insects underlined with red ink have had their names confirmed by Mr. Say; and the names and observations in red ink are those sent to me by Mr. Say, after he had examined the collection which I sent to him in November, 1833. To the uniques sent to Mr. Say are added the letter U."

Turning over the pages of this Catalogue to the heading "Index Hemipt, Section Omopt", and running down the numbers, one comes to "224 *Membracis vau* S Mss. Membracis? June 15, 1832. Camb. June 15, 1835". The words above, *Membracis vau* S., are in red ink. So it is apparent that in November, 1833,

Harris sent to Say the specimen bearing the red ink label U, collected June 15, 1832, and that Say returned it with the name *"Membracis vau"*, which Harris entered in his Catalogue in red ink, so indicating its identification by Say. At first sight that would seem conclusively to establish the identity of *vau*,—this unique Harris specimen determined by the describer himself as identical with his *vau*. But the specimen does not well accord with the original description! It does not fit it! It has no transverse line near the tip, which much exceeds the end of the nervures of the hemelytra. Could Say himself have made a misidentification of his own species? Why not? At that time *vau* was the only species yet recognized and described which is assignable to this genus. What more natural than that Say should recognize the generic relationship and assume Harris's specimen to be identical with the sole species known—possibly regarding the differing form and pattern as constituting but a variant of that species? For many years and by many students this species has been regarded as subject to great variation, Dr. Fitch for instance, in 1851, briefly indicating ten different varieties of *vau*, eight of which later study has shown to represent two other subsequently described species.

And what did Dr. Fitch himself recognize as typical *vau* Say? Not the species represented in the Harris collection and so determined by Say, but that species which Van Duzee in his "Studies" seems to have regarded as *sculptus* Fm. This specimen is still in the Albany "Cabinet", with Dr. Fitch's printed label No. 658 on its pin, as indicated in his published record,[1] and though somewhat faded is clearly recognizable. And this specimen does agree with Say's description of *vau!* It would be interesting to learn how Dr. Fitch arrived at his determination; but however arrived at, I have no doubt it is correct.

As is well known, a part of Dr. Fitch's material was acquired by the National Museum, and included in that is a much less faded example of this species, a female, bearing on its pin what I was advised at the Museum was Dr. Fitch's large black bordered label with the inscription *"Thelia vau* Say, New York,

[1] Cat. Homop. Insects State Cabinet Nat. Hist., 4th Ann. Rept. N. Y. Univ. 1851, p. 48.

Ark." Passing over the question as to whether the specimen came from Arkansas, in which State there is at present no place named New York, nor have I seen any other specimen from that section; or from New York State, possibly the Adirondack region, the label is interesting in that it bears, under the words *"vau* Say", and in smaller pen printing, the words "sculpta Fairm."! So Dr. Fitch, if that label be his, had come to the conclusion that Fairmaire had before him, when describing *sculpta,* the same species which was before Say when the latter described *vau.* That accords with the conclusion independently arrived at by me. Specimens with the anteapical vitta sub-obsolete, conspicuous only at dorsal carina, are frequently found. The species here determined to be *vau* Say averages about 6.25 mm. in length, and while not quite so long as given in Fairmaire's description, 7 mm., fits it otherwise fairly well; and has long stood as *sculptus* Fairm. in many collections, including my own. No other species known to me accords with that description so well as does *vau* recognized as above. I am not unmindful of the pale form here referred to *fuliginosus* Emmons. In many respects that too answers fairly well to the description of *sculptus,* though the length is still about a millimeter too little. But it is much more than "a little elevated", and a good deal of imagination is required to see the thinner areas on its dorsal margin as "two almost transparent spots", which Fairmaire describes with greater emphasis than is used on the same page in describing them in *tuberosus,* so very conspicuous in that species. With this eliminated, I believe Fairmaire's *sculptus* should be regarded as based upon the same species as Say's *vau,* described in 1831, and if it is, the latter name has fifteen years priority, and Fairmaire's *sculptus* must be placed in the synonymy of *vau.*

Figures of the male and female of this common species in the northeastern United States and Canada are given on Plate I, Figs. 1 and 2, that there may be no confusion as to just what species is here considered.

Cyrtolobus limus Van Duzee.

This species is somewhat smaller than *vau* Say as here recognized, with its anterior and posterior vittæ broad and white, and the mid-dorsal translucent spot conspicuous. It was described

from Colorado, and is found in the Rocky Mountain region, commonly on *Quercus gambelli.*

Cyrtolobus pulchellus new species.

The following new species is of medium size, with a high, strongly compressed crest, the white markings conspicuous and coloring sharply contrasted. In form and pattern it suggests the little *parvulus* Woodruff (post), but is very much larger, and shows these differences, among others: Lacks the mottled aspect; arch of crest from base of metopidium more retreating; keel but little raised immediately above humeri, slightly sinuate at very prominent anterior white spot, suddenly descending anterior to anteapical vitta; posterior process attenuate; apical cloud of fore wings less squared; femora above pale. Its coloring is about that of *gramatanus* Woodruff (post), but from this it differs in being larger, very much higher, and with a totally different form of pronotum, as well as in lacking the maculation at middle of fore wings, though the veins of the latter in that region are often slightly darkened. Figures of the holotype and allotype are appended, and their description follows:

Cyrtolobus pulchellus, new species. (Plate IV, Figs. 29, 30.)

FEMALE: Medium in size, the crest strongly compressed, arching from back of humeri to just before anteapical sinus, the pronotal tip attenuate, and the colors sharply delimited by black.

Face dull testaceous, sometimes yellowish, the sutures distinct, often narrowly marked with rufous or black; clypeus produced beyond line of genæ, little incurved, the genæ strongly sinuate inwardly near eyes.

Pronotal carina curving evenly over slightly retreating metopidium from base to above humeri, thence with slight sinuation at pronounced anterior white spot to summit just before mid-dorsal translucent spot, thence descending gradually to half way between that spot and anteapical vitta, where it develops an abrupt declivity, is sinuate over that vitta and continues to tip of the somewhat extended and attenuate posterior process; the tip of the latter sharp, attaining as far caudad as apex of terminal areole of fore wings, in some specimens attaining only to its basal angle. Metopidium yellowish testaceous, carina black from base to summit, broad strongly arched reddish supra-humeral bands recurved to post-humeral sinus, the humeri yellowish with a reddish blotch on their anterior face, and more or less mottling of rufous and black anterior to the oblique vitta. This vitta is very broad at lateral margin and at carina of pronotum, but

more or less interrupted about the middle, its posterior margin leaving lateral margin of pronotum a little anterior to posterior margin of mid-dorsal translucent spot, directed obliquely forward to below but not reaching lower anterior corner of that spot, thence more arcuately forward to slightly anterior to rear of post-humeral sinus, thence vertically to carina of crest. Mid-dorsal translucent spot broad and deep, conspicuously square, very strongly compressed to its bottom. Anteapical vitta broad at margin, widely expanding forward and rearward till at carina it equals or exceeds width of mid-dorsal translucent spot. All vittæ white broadly margined before and behind with black. Pronotum between vittæ dark red, apex beyond black border of anteapical vitta white, more or less besprinkled with black or rufous.

Body beneath testaceous, ninth abdominal segment in dry holotype and other specimens before me washed with rufous.

Fore wings hyaline, darkly infuscated at base; veins pale, very slightly enfumed at middle; tip with more or less rounded very dark brown cloud covering terminal areole and apical third of cell above it, but not extending up terminal margin above that cell, margin slightly enfumed between apical cloud and pronotal tip.

Legs, including the femora, testaceous.

Length 5.65 mm.

MALE: Like the female, but a little lower and much darker.

Pronotum before the anterior oblique vitta washed with blackish red except at middle of base and shoulders; between the vittæ almost black, the compressed crest somewhat bulbous between the squarish mid-dorsal translucent spot and the very broad anteapical vitta; its apex wholly black, or reddish, sharp, but not so produced as is that of female generally, reaching hardly beyond basal angle of terminal areole of fore wings.

Body beneath black, ventral segments testaceous marked with black on sides, middle, and sexual organs.

Legs also as in female, wholly testaceous.

Length 5.40 mm.

Holotype ♀. West Nyack, N. Y. VI/11/'20. (C. E. Olsen.) In my collection.

Allotype ♂. Same locality and date and collector. Also in my collection.

Paratypes in collections of Chris. E. Olsen and Am. Mus. Nat. Hist.

Of this distinct species, one of the many denominated *vau* in collections, and for the types of which I am indebted to Mr. Olsen's generosity, I have a considerable series before me. Besides the type locality it has been taken in various places in the northern half of New Jersey. No record of its host plant is at present available.

Cyrtolobus parvulus new species.

Among the many forms which have been standing in various collections under the name *vau* of Say is the following distinctive little species, one of the smallest in the group. It bears the usual pronotal pattern, and is perhaps most easily set apart from other similar small species by the jet black upper surface of the femora of the female. Figures of specimens of both sexes are here presented, and their description follows:

Cyrtolobus parvulus, new species. (Plate IV, Fig. 31, 32.)

FEMALE: A brown and red species with a rather mottled aspect, having the usual white markings prominent.

Face between eyes a little broader than long, yellowish testaceous, sprinkled with small brown punctures. Clypeal sutures distinct, clypeus a little produced, incurved.

Pronotum coarsely and roughly punctured, including humeri, decidedly elevated, compression of keel beginning below middle of metopidium, pronounced anterior to and above humeri, strongly compressed at mid-dorsal translucent spot, the lower anterior corner of which seems conspicuously sunken by reason of the decidedly tumidous swelling of the crest immediately before it, very evident from a front view. Crest arches from base of metopidium to highest point just back of post-humeral sinus but anterior to mid-dorsal translucent spot, and thence slopes undulatingly, with slight sinuations at mid-dorsal spot and anteapical white vitta, to apex, which exceeds terminal areole of fore wings and attains middle of their terminal border. Metopidium flavo-testaceous, thickly marked with dark brown punctures, congregated so as to form dark brown spots above callosities and over humeri, the latter washed with light brown. In one specimen at hand these punctures are light brown, the dark brown being confined to the spots above callosities over eyes. Anterior oblique vitta indicated at lateral margin by a usually well developed white spot with a tendency to run forward along margin, and which, in the type and in some other specimens before me, but not in all, rises with indefinite forward bounds toward anterior lower corner of mid-dorsal translucent spot but does not reach it. This vitta is bordered posteriorly by a narrow black line which curves up and forward to lower anterior corner of mid-dorsal white spot, and then rises abruptly along the anterior edge of the latter to summit; a branch also sometimes runs forward from lower anterior corner of mid-dorsal white spot to anterior white spot, and then bordering the latter posteriorly rises to summit. Keel on rising from metopidium blackish, immediately succeeded by a large white spot, thence rich dark red to apex, interrupted by squarish (sometimes elongate) prominent mid-dorsal translucent spot and by anteapical vitta. The latter white, broad, extremely so on carina, narrowing as it approaches lateral margin, its posterior border

sloping strongly cephalad from summit to margin. Dark red surface of apical process somewhat besprinkled with small testaceous spots.

Body beneath dingy testaceous.

Fore wings clear hyaline, veins flavous, tips from below apical process of pronotum broadly very dark fuscous, anterior border of fuscous cloud squared, covering terminal areole.

Legs dingy testaceous, femora above on all legs shining jet black.

Length 5 mm.

MALE: Like the female, but decidedly smaller, arching evenly and much lower, markings usually the same, and differing only as follows:

Face washed with red, sutures between clypeus and loræ black. In some specimens face is dirty testaceous, black centrally above and adjacent to eyes.

Pronotum rather low, sinuations much less marked, apical process hardly attaining basal angle of terminal areole of fore wings. Base of metopidium and humeri washed with pink in allotype and some specimens, in others dingy testaceous. Sometimes the whole of metopidium is thus washed, and the brown mottling seen in the female lacking. The dark red of the pronotum in that sex varies in the male from black to pale red. The oblique anterior vitta here shows a tendency, more rarely seen in the female, to form a connection with anterior white spot on carina.

Body beneath and abdominal segments black; genital segments and organs clear testaceous, hooks of styles and caudal half of keel of sternal plate black.

Fore wings often very slightly suffused with flavous, fuscous at tip, in most specimens at hand the clouding not reaching apex of pronotal process, but covering terminal areole as in female.

Legs dull testaceous, femora above black.

Length 4.5 mm.

Holotype ♀. Lakehurst, N. J. VII/2/'22. Taken on *Quercus prinoides*.

Allotype ♂. Lakehurst, N. J. VI/16/'17. "Beating Oak," Both in my collection.

Paratypes: Three males and twenty-six females, Lakehurst, N. J. In my collection. Also one male and one female, same locality, in collection of W. T. Davis.

This little species is not likely to be confused with any other than *puritanus* herein described, from which it may be distinguished by its slightly greater size, its coarser, rougher punctuation, wholly lacking any lustre, notably over the shoulders; by the swelling of pronotal crest between anterior and mid-dorsal spots, that part being included in the dorsal compression of *puritanus;*

by the greater extension of pronotal apical process in the female; by the brown mottling of metopidium and over humeri, particularly in the female; by the conspicuous white anterior spot, the somewhat narrower mid-dorsal translucent spot, and in the female the dark red apical process besprinkled with white; by the black superior surface of the femora of all the legs in the female, and the much darker and more extended apical cloud of the fore wings.

It has been found by me almost without exception on *Quercus prinoides,* and I have no doubt that that is its preferred if not exclusive host plant.

Of this species I have seen none but Lakehurst examples except from localities on the south shore of Long Island, N. Y., the fauna and flora of which is in many respects notably like that of the "pine barrens" of southern New Jersey, and a series of one male and five females taken on "scrub oak" at Karner, N. Y., a locality where both *Quercus ilicifolia* and *Q. prinoides* abound.

Cyrtolobus puritanus new species.

The following new species is the smallest of the genus known to me, as well as one of the liveliest in both sexes. My captures have been but a fraction of those shaken into my umbrella. It is especially neat in appearance, and in form, color and pattern roughly suggests a miniature *vau.* From other small species it is most conspicuously differentiated by the disproportionately large mid-dorsal translucent spot, and the marked compression of the pronotum in that region. Figures of specimens of both sexes are herewith presented, and their description follows:

Cyrtolobus puritanus, new species. (Plate V, Figs. 33, 34.)

FEMALE: Moderately elevated, but notably small; punctures rather distant, shallow and small over humeri; somewhat shining; dark reddish brown with the usual white markings slightly dingy; the mid-dorsal translucent spot conspicuously broad.

Face between eyes broader than long, hairy, testaceous, sparsely covered with small pink punctures, darker bordering eyes and on frons. Clypeal sutures indistinct, those bordering loræ indicated by red lines in holotype, by brown in other specimens, the loræ produced below genæ; clypeus broad, incurved.

Pronotum strongly compressed at the middle for at least half its height, the keel consequently sharp and narrow, including in considerable degree

that part of the crest anterior to mid-dorsal translucent spot. It arches from base of metopidium to highest point above post-humeral sinus and a little before mid-dorsal spot, further rearward than in *parvulus* Woodr. (ante), and thence slopes to apex with posterior sinus slight but evident. Anterior sinus absent, but indicated by a very small white spot placed far forward at summit of metopidium. Posterior process attains apex of terminal areole of fore wings. Metopidium hairy, testaceous at basal middle, narrowly over humeri, and at margins of post-humeral sinuses. Carina of metopidium black, interrupted by four successive white spots. Two reddish brown bands arise at callosities over eyes, expand above, becoming a brighter red over humeri, and extend broadly beneath mid-dorsal translucent spot to anterior margin of white oblique vittæ. The latter arise at mid-lateral margin, are sharply defined, gradually narrowing and running into mid-dorsal spot at about the middle of its lower edge and not extending beyond it. Mid-dorsal translucent spot conspicuously large—broad, deep, squarish—extending below base of deep compression, but broader than deep. Surface anterior to it dark red with black punctures, and posterior to it wholly dark red. Anteapical vitta rather broad, widening broadly on carina, bordered anteriorly with black punctures. Apical process beyond this vitta long, about one-quarter the length of pronotum along lateral margin, testaceous, sparsely punctured with black.

Body beneath testaceous, ovipositor dark basally.

Fore wings dingy hyaline, veins flavous, apex very slightly infuscated.

Legs pale testaceous, fore femora slightly infuscated above.

Length 4.40 mm.

MALE: Like the female, slightly lower and smaller; color darker and richer, with the white markings a clearer white, and differing only as follows:

Face more or less washed with red, in some specimens with brown, and with many black punctures, including clypeal sutures.

Pronotal callosities over eyes black, punctures rather fine, distant and black; apical process more or less blunt, dark red with black punctures, attaining only to basal angle of terminal areole of fore wings.

Body beneath and abdominal segments black, genital segment pale, styles and lateral valves black.

Fore wings clear hyaline, a broad fuscous cloud along apical margin broadly invading terminal areole, veins blackish.

Legs pale, all the femora above black.

Length 4.10 mm.

Holotype ♀. Litchfield, Conn. VII/8/'21. Taken on *Quercus coccinea*.

Allotype ♂. Same locality and host plant. VI/15/'22. Both in my collection.

Paratypes: Three males and four females, Litchfield, Conn., in my collection; one male and one female each, as follows: White Lake, Can.,

Funkhouser collection; Lake Toxaway, N. C., Slosson collection; Roselle Park, N. J., coll. Am. Mus. Nat. Hist., N. Y.; Auburndale, Mass., coll. C. W. Johnson; Jamesburg and Cranford, N. J. respectively, Davis collection; and females as follows: St. Anthony Park, Minn., coll. Univ. Minn.; Atherton, Mo., coll. Univ. Kansas; Pleasant Valley, Conn., coll. Brooklyn Museum.

A very considerable series of this species is before me, including material from Toronto, Can., New York, Long Island, N. Y., Pennsylvania, and Georgia, in addition to the states above cited. It is a very distinct little species, particularly notable for its small size and proportionately large, square, strongly compressed mid-dorsal translucent spot, and its clear unmottled coloring. It has been found confused in several collections with the species last above described (*C. parvulus* Woodr.), both masquerading under the label *vau*. Its distinction from *parvulus* has been fully pointed out in the discussion of that species. From the records at hand it is evidently widely distributed throughout the north and east, extending south in the higher altitudes.

Cyrtolobus acutus Van Duzee.

The remarkably narrow and produced clypeus serves as an excellent specific character by which to recognize this very slender small species, marked with the usual vittæ and pellucid spot so prevalent in the genus. Its habitat seems to be in the mountainous parts of our central-western and southwestern states.

Cyrtolobus maculifrontis Emmons.

I am somewhat at a loss to account for the close association to *"vau"*, taking that reference to mean the species here designated as pale *fuliginosus*, accorded this species by Van Duzee in his "Studies", as well as for the extreme length with which he there credits it. His characterization of the species in other respects certainly accords with the extensive material which I have accumulated; but that material is of one of the decidedly smaller species, the females measuring from an extreme length of 5.5 mm. down to 4.5 mm., and the males averaging less, as usual; and their appearance is very distinctive, much more nearly approaching *intermedius* than *vau* or *fuliginosus*. It may be that a pale speci-

men of the former, heretofore commonly associated with *vau,* was in mind. In this connection I might advert to the possibility of the confusion of two species here. It may be observed that Mr. Van Duzee based his remarks on *maculifrontis* primarily upon a series taken by him in Georgia. The males of my Alabama material, and a series of males before me from Clayton, Ga. (W. T. Davis) and Southern Pines, N. C., average considerably larger than northern males, and are wholly pale beneath instead of black. Nevertheless, their general habitus is that of this species, and I do not feel warranted in separating them. Mr. Van Duzee's question of the accuracy of Emmons's figure must have been due to paucity of examples, for the anterior oblique vitta frequently is apparently transverse, arising vertically from the lateral margin and joining the mid-dorsal translucent spot, its forward extension obscured. Between this combination transverse band and the anteapical vitta the pronotum is usually contrastingly darker than the surface anterior to it. This is true in both sexes; but it should be borne in mind that the markings in this species tend to obsolescence. The anteapical vitta is wide and crosses the posterior process unusually near its apex. This feature, and the dark surface before it, the somewhat hairy character and coarse punctuation of the pronotum, and in the male its abbreviation, the lateral margin curving upward to apex so as to expose an unusual proportion of the flavous hyaline fore wings without apical cloud, serve to aid in the identification of those frequent specimens in which the black blotches on the metopidium are lacking. The figure of a male is herewith appended on Plate V, Fig. 42, in which the yellow pigment of pronotum is replaced by a rich brown, the frontal pronotal blotches and other markings sub-obsolete, but the posterior darker saddle nevertheless evident. This color form is common. The specimen figured was taken at Litchfield, Conn., VI/29/'20 on *Quercus alba,* and measures 4.45 mm. in length.

Cyrtolobus intermedius Emmons.

Cyrtolobus intermedius Emmons is a species which, as I understand its status, is subject to wide range in color and definition of pattern, in some respects wider than in *rufulus* herein described. The species was founded by Emmons on what was probably a female specimen, of a wholly dark mahogany red without

evident vittæ or other markings, and well figured on Plate XIII, Fig. 16, of Vol. 5, Agri. Nat. Hist. of New York (1854). Examples of such females are by no means rare; but those with the presence, indicated in varying degree, of vittæ and the mid-dorsal translucent spot on the dark red surface are more frequently met with, and this surface color itself, if I apprehend the species aright, tends to range through lighter and lighter shades till the extreme of pale creamy color, with markings again obliterated, is reached. The more common forms are predominantly pale with the usual *Cyrtolobus* pattern, and of these I have examples which I have taken *in copula* with males absolutely indistinguishable from males thus taken with females of the dark red mahogany form. Furthermore, no structural feature to differentiate the pale and dark forms can be discerned by me, while some marked characters are shared by both. Though invariably separated in the collections examined, the pale ones variously assigned, usually either to *vau* Say, *fenestratus* Fitch, or *discoidalis* Emmons, the conclusion seems irresistible to me that they are the same. The figure of a very pale reddish yellow female with markings obscurely indicated is here shown on Plate III, Fig. 22. It was taken at Litchfield, Conn., VI/23/'22, in copulation with the male shown in the accompanying Fig. 21, and as that color phase differs widely from the type form and has not yet been described, its description is herewith presented in detail.

Cyrtolobus intermedius Emmons.

FEMALE: A pale yellowish, low arched species, almost testaceous, with the usual vittæ and pellucid dorsal spot present, but tending to obsolescence. Punctuation rather fine, granulate.

Face between eyes but little wider than long; clypeus broad, somewhat produced, but only slightly below line of genæ, sutures distinct. Color yellowish testaceous, sparsely covered with slightly reddish, or more frequently black, punctures.

Pronotum low, rounding over humeri, arching very little, highest back of post-humeral sinus, strongly compressed at mid-dorsal translucent spot as though with blunt-pointed forceps, producing a seemingly foveate compression beneath that spot; a little swollen in outline and laterally between mid-dorsal spot and anteapical vitta; posterior process hardly differentiated, not decurved, reaching middle of terminal areole of fore wings. Color pale yellowish on metopidium, with two narrow light red bands rising from callosities over eyes toward but not reaching its summit over humeri. A

more or less indistinct dingy white anterior oblique vitta arising from middle of lateral margin, curving forward well below small mid-dorsal translucent spot, and reaching carina of crest above post-humeral sinus, back of which the pronotal surface is dull light reddish, more or less mixed with yellowish. Anteapical vitta vertical, correspondingly obscure. In some specimens the anterior and posterior parts of the pronotum are more contrastingly yellowish and reddish respectively; and in many the surface is generally suffused with dark reddish, suggesting the type form; but even in these the short shoulder stripes are discernible, and the weak vittæ and mid-dorsal translucent spot are more evident in contrast.

Body beneath flavous.

Fore wings hyaline, rather dark reddish over corium, veins and terminal border distinctly flavous. No terminal cloud.

Legs pale testaceous.

Length 5.60 mm.

The male of this species, not heretofore described, is characterized below, its description being drawn from a specimen taken by me in copulation with a dark red female closely corresponding to Emmons's figure, but with the mid-dorsal translucent spot present. It is practically indistinguishable from the male shown in Fig. 21.

MALE: Smaller and even lower than female.

Face testaceous, unevenly marked with black punctures. Clypeus but little produced.

Pronotum with characteristic fovea below mid-dorsal translucent spot; apical process not reaching to basal angle of terminal areole of fore wings. Metopidium testaceous centrally to its summit, dingy white laterally above eyes, over humeri and along post-humeral sinus and lateral margin to a conjunction with anterior oblique vitta at its marginal origin. This vitta in the specimen in hand is much interrupted by the black of pronotal surface. Bands from callosities over eyes black, in some specimens dark reddish brown, expanding on summit of metopidium and continued back so as to fill the space between the dingy white of the oblique vitta and lateral margin. The remainder of the pronotal surface in this and most specimens is black, the white mid-dorsal translucent spot and anteapical vitta in sharp contrast against it. In many examples however the black of the pronotum is replaced by brown or by a dark red.

Body beneath black, lateral valves of genital segments and sternal plate dark red.

Fore wings hyaline, with dark red corium, and dark fuscous cloud almost covering terminal areole and apical portion of cell above it.

Legs testaceous, femora above black.

Length 5.50 mm.

Allotype ♂. Litchfield, Conn. VI/30/'23. In my collection. Taken with female in copulation, on *Quercus coccinea*.

This species, in size decidedly smaller than *vau* Say, with which it is often confused, is, as stated above, generally pale in the female, with the male very similar to the male of that species. In the latter sex the conspicuous extension of the pale color of the anterior oblique vitta from its lateral origin forward along margin of pronotum and over post-humeral sinus to base of metopidium will serve to distinguish it from *vau,* while both sexes are characterized by the strong foveate impression at the base of the mid-dorsal sub-pellucid spot, and by the base of the fore wings being dark reddish, the apices of those of the female without fuscous cloud.

It may be worth while to call attention to the humeral bands in this species for the purpose of emphasizing that their presence is not to be taken as the exclusive hallmark of *discoidalis* Emmons. Several other species possess them as well. Its distribution is general throughout our northeastern territory; and in New York, including Long Island, and Connecticut, the state in which most of my collecting has been done, it is abundant, and is found on almost any species of large oak.

Cyrtolobus gratiosus new species.

The following new form, apparently represented in my collection by both sexes, and from their general habitus seemingly entitled to specific recognition, is nevertheless accorded it here with some diffidence. The difficulty lies in delimiting it, owing to the very scanty material thus far observed which I have felt warranted in segregating as components of this species. The several specimens which have been associated in my box with those hereinafter designated as the types have been so allocated tentatively; yet no other assignment of them seems to me plausible; nor do the types seem very closely related to any known form, pale specimens of *intermedius* Emm. perhaps presenting the nearest approach to them. It is earnestly hoped that further material will be acquired which will tend to furnish a clearer apprehension of this species, particularly a copulating pair, as the holotype and allotype herein described are associated together as one species only by reason of similar facies and a common locality of capture. It is below medium size, very little elevated on pronotal carina,

its most distinctive superficial character being the olivaceous yellow of the fore part of the pronotum.

Cyrtolobus gratiosus, new species. (Plate III, Figs. 23, 24.)

FEMALE: Face between eyes a quarter wider than long. Yellowish testaceous, coarsely punctured. Clypeus moderately incurved, its sutures at loræ outlined with black punctures, such punctures condensed at inner margins of eyes and on frons. Eyes dark.

Pronotum anterior to the oblique vitta olivaceous yellow, marked with two narrow reddish bands arising at inner edge of callosities above eyes but hardly extending above humeri. Anterior and posterior carinal sinuses evident but not deep, pronotum arching very slightly and almost evenly to apex, which is produced only as far caudad as the basal angle of terminal areole of fore wings. Anterior oblique white vitta is somewhat obscured above by the olivaceous coloring that borders it anteriorly, meets the lateral margin behind the middle and broadens somewhat as it approaches it. Mid-dorsal translucent spot conspicuous, rectangular, wider than deep, not extending below compression. Anteapical white vitta broad, distinct, vertical. Pronotal surface otherwise blackish brown, darkest bordering the vittæ, along carina and at apex.

Body beneath testaceous.

Fore wings clear hyaline, veins contrastingly dark, the terminal areole large, its sides diverging at more than a right angle. Apex very slightly clouded, the terminal areole scarcely invaded.

Legs testaceous.

Length 5.60 mm.

MALE: Like the female, a little smaller and even less elevated. Colors deeper.

Pronotum with the anterior oblique vitta quite obliterated superiorly by the invading olivaceous brown. In some specimens this olivaceous tint becomes lost, the forward pronotal surface being grayish brown, if certain examples which I have tentatively associated with the allotype here are correctly so associated.

Body beneath black, the genital segments flavous, tips of the organs black.

Fore wings as in the female, their tips slightly more infuscated.

Legs testaceous, fore femora above black.

Length 5.5 mm.

Holotype ♀. Litchfield, Conn. VII/1/'20. Taken on *Quercus rubra.*

Allotype ♂. Litchfield, Conn. VI/22/'20. Taken on *Quercus coccinea.* Both in my collection.

It has been suggested above that this prettily marked species is perhaps most nearly like *C. intermedius* Emmons. It is however distinguished from the paler forms of the female of that

species as here understood by being much more contrastingly patterned between the fore and hind parts of pronotum, less elevated, fore wings clearer hyaline, and lacking the deep foveate character of the dorsal compression which marks that species whatever its color variation. The males are more difficult to differentiate satisfactorily, though here again the foveate impression below the mid-dorsal compression is not so deep, and the broad dark humeral bands are lacking. Figures of both holotype and allotype are herewith presented.

Cyrtolobus griseus Van Duzee.

This species was described from three females taken at Effingham, Kansas, and is rather widely distributed in the middle west. The length of a female of average size from Illinois, which Mr. Van Duzee has kindly compared for me with the type, and which he pronounces the counterpart of a paratype taken with the type, is 6.25 mm., thus materially exceeding the average length, 5.60 mm., of the female of *C. cinereus* Emmons, or as determined in this paper *C. pallidifrontis* Emmons, with which it was compared in the original description; but while it doubtless averages larger than that species, some specimens at hand are of substantially the same size. All seen by me, however, have their legs wholly pale, and the arch of the pronotum, while low, decidedly greater and higher anteriorly than in that species. Examples occur in which the gray of the pronotum back of the anterior vitta is somewhat reddish, sometimes decidedly so. Such specimens approach in general appearance many northern examples of a species which I am not able to distinguish satisfactorily from one taken in the south, hereinafter described under the name *C. rufulus*, typically smaller and from typical *griseus* evidently distinct. It may be that these seeming intermediates are themselves entitled to specific rank, but I do not feel justified in so recognizing them at present.

Regarded as a member of the group which includes the three following species as well, *griseus* may be distinguished from the others as decidedly the greatest in size; and from the species most nearly approaching it in that particular, *pallidifrontis* Emmons, it differs in having all the femora wholly pale, and the fore wings immaculate except for a slight apical cloud.

Cyrtolobus pallidifrontis Emmons and *cinereus* Emmons.

C. pallidifrontis Emmons was figured without description, but with what appears to be an excellent representation of the female, in the Natural History of New York, Part V. Agriculture, Plate XIII, Fig. 7. Its recognition, however, has usually proven to be a stumbling block. The suggestion is here made that this species is that which stands in most collections under the name *cinereus* Emmons. Students of the group have generally recognized as that species a form widely distributed in the north and east with unusually low pronotum and fore wings maculate at their middle, and so assigned by Van Duzee in his "Studies"; but there is no doubt in my mind that the species so recognized is *pallidifrontis* Emmons, and in all probability not *cinereus* Emmons. For several years I have had a series of specimens which, following the customary recognition of *cinereus,* have stood in my box under that specific name, with the special label *pallidifrontis* placed at their side, so closely did they conform in shape, coloring and pattern with the figure of the latter cited above; and recently I discovered a grayish specimen among the material acquired by the United States National Museum from the Fitch collection with a narrow green label bearing the name *pallidifrontis* in handwriting. Emmons states (p. 153, Footnote) that his account of the Membracidæ is based upon Fitch specimens. This specimen, upon direct comparison, agrees almost exactly with Emmons's figure in form, shading and markings, including the unusually broad anteapical vitta, slightly exaggerated in the figure. It also agrees substantially with the above mentioned specimens in my box. Notwithstanding that it is a little less gray, it accords so closely with the figure that it may be the actual specimen from which it was drawn! I believe the probabilities are in favor of that presumption. In that case this specimen, bearing also a label with the number 11,763, has a plausible claim to be regarded as the type of *pallidifrontis* Emmons, and can at least be chosen as its lectotype, as is here done. It follows that what we are calling *cinereus* should be known as *pallidifrontis.* Under the name *cinereus* Emmons this species has been described by Van Duzee on page 91 of his "Studies" (ante), and in greater detail by Funkhouser on page 276 of his "Biology of the Membracidæ

of the Cayuga Lake Basin",[1] so a further description is not presented here, other than to point out that the above mentioned National Museum specimen has a pale pinkish wash on face and metopidium, and a reddish tint on pronotum between the posterior black border of oblique vitta and anterior black border of anteapical vitta, these tints not shown in the figure. The specimen also has reddish spots above the metopidian frontal callosities, indicating the beginning of obsolete supra-humeral bands, a broadening downward of the pale anterior vitta to the lateral margin, and a broad but very shallow mid-dorsal translucent spot. The fore wings are clouded at base, middle, and very broadly at apex, entirely infuscating the terminal areole and encroaching on its neighbors. The black of the femora above, characteristic of this species, is shown in the figure.

Now as to whether the two names are of one species. A comparison of the two figures in question, both given on Plate 13, assuming them to represent the same sex, as well as the inapplicabality of the description of *cinereus* to the figure of *pallidifrontis,* render that hypothesis untenable. Nor is it supported on the assumption that the figure and description of the former were drawn from a male specimen. I have never thought that Emmons's figure of *cinereus,* or his brief description itself, accorded at all well with either sex of the species generally assigned to it. He describes particularly (p. 156), and figures graphically (Fig. 3), a brown insect with a broad lighter brown sagittate mark on the anterior dorsal surface of the pronotum. What we know as *cinereus* would, in the female at least, hardly be called brown, nor does it accord in color with his figure. Since the males are frequently brownish, and often have the mid-wing maculation obsolescent, I have given special consideration to the possibility that Emmons had a male specimen of this (or some other) species before him in describing and figuring *cinereus,* but no specimen has been found by me to accord with either description or figure. As to the arrowhead mark, in the very large aggregate of specimens of both sexes which I have examined, literally hundreds, I have never seen this matched, hardly approached. The conspicuous maculation of the fore wings of the female of

[1] Cornell Univ. Agri. Exp. Station. Mem. II. 1917.

this species (*pallidifrontis*) is not referred to in the brief description of *cinereus*. My conclusion is, *pallidifrontis* Emmons is a good species, identifiable, not synonymous with *cinereus* Emmons, and that we do not know *cinereus*.

It should be noted that in eastern New York and New England *pallidifrontis* is usually more grayish than red, but that with the grayish form reddish specimens also are found, the reddish ones, however, predominating in western New York, Pennsylvania, and Illinois. But these are clearly all one species. For convenience of reference figures of both sexes of this very low and elongate species are hereto appended (Plate IV, Figs. 25, 26), the specimens having been taken at Litchfield, Conn.

Cyrtolobus gramatanus new species.

The following new species belongs to the group having fore wings maculate at the middle. From *pallidifrontis* Emmons, as I recognize that species (above), it differs in the female by being smaller, and arching proportionately and actually higher anteriorly, the crest from frontal view higher above humeral plane, and the depth of the mid-dorsal translucent spot therefore greater; in having the pronotum back of the anterior oblique vitta usually bright red; in the total absence of black from the femora of both sexes; and in the less squared terminal cloud of fore wings. Its type of ornamentation is that of p*allidifrontis* as figured by Emmons, but contrary to the character of pigmentation disclosed by a large series of that species, the colors are much clearer and more sharply defined—not at all confluent as they frequently are in *pallidifrontis*. It is further distinguished from that species by its coarser punctuation, its surface therefore rougher than in *pallidifrontis,* which has a rather silvery sheen. In the male it differs particularly in being proportionately higher arched, and its coloring and pattern are more usually very much as in the female, instead of commonly black or brown as in that species. In fact, it is not very closely related to it, being here compared with and differentiated from it because both have the fore wings maculate at middle. Figures of a male and female of this new species, taken *in copula,* are herewith presented, and their description follows. The name selected was that of the Chief of the Indian tribe which originally had as its home and hunting grounds

that part of the country where I have found this species most abundantly, to-wit, the type locality.

Cyrtolobus gramatanus, new species. (Plate IV, Figs. 27, 28.)

FEMALE: Rather small, moderately arched, its coloring more or less sharply contrasted by delimiting black lines; its fore wings strongly maculate at base, middle and apex with brown.

Face testaceous, usually immaculate and washed with rose, sutures distinct, clypeus very little produced.

Pronotum arching moderately, commencing its even curve well forward immediately above humeri, the middle of dark space between incidence of anterior vitta on carina and mid-dorsal spot also well forward, intersected by an imaginary vertical line arising from posterior point of post-humeral sinus, the summit of the crest attained at the anterior angle of the mid-dorsal translucent spot. Metopidium yellowish testaceous over humeri, more grayish centrally, with black carina. From callosities over eyes arise two broad brick-red bands curving over humeri to rear of post-humeral sinuses. Humeri themselves are very often brick-red. Anterior white spot on carina above post-humeral sinus small, but usually present. Anterior oblique vitta arising from lateral margin forward of middle, directed toward dark space posterior to anterior white spot on carina, and rarely connected with the latter by irregular white maculations, usually abruptly terminating about half way to summit, though occasionally showing at this point an indistinct horizontal forward extension which rises again to anterior white spot; this vitta bordered behind and interruptedly before by broad black lines. Anterior to this vitta the pronotum is more or less maculate with white. Mid-dorsal translucent spot conspicuous, broad and rather shallow. Anteapical white vitta erect, exceptionally broad, especially on carina, bounded before by a broad black line; the space between these vittæ bright red. Apical pronotal process beyond the vitta usually rather short, blunt, and testaceous with brown punctures, attaining middle and at times apex of terminal areole of fore wings.

Body beneath pale yellowish testaceous.

Fore wings hyaline, clouded at base, middle and apex with brown, the cloud broad and distinct at middle, rounded at apex, covering terminal areole.

Legs, including femora, pale yellowish testaceous.

Length 5.20 mm.

MALE: Like the female, but lower.

Face wholly testaceous; the reds of crest becoming dark brown or black on metopidium, on central pronotum very dark red; the vittæ lack the delimiting black lines, and so are less sharply contrasted, but the anteapical vitta is usually broad, as in the female.

Body beneath and abdominal segments laterally black, ventrally pale testaceous.

Fore wings hyaline, apical cloud rounded, cloud at middle sub-obsolete.

Legs, including femora, pale testaceous.

Length 5. mm.

Holotype ♀. Bronxville, N. Y. VI/14/'14. Taken on *Quercus platanoides.*

Allotype ♂. Same locality, date and host plant. Holotype and allotype taken in copulation. Both in my collection.

Paratypes: A large series of both sexes from the type locality are before me, which may be regarded as paratypes.

Besides those taken by me for several years past at Bronxville, Westchester County, N. Y., mostly on *Quercus platanoides,* including several copulating pairs, I have seen many specimens from Long Island, N. Y., and the lower Hudson River region and from New Jersey, as well as one female in Mr. Olsen's collection from Rutland, Vermont.

The possibility has been considered and rejected that this species might be that figured and described as *cinereus* by Emmons, not yet recognized by me. While it is common in at least parts of New York, from which State most of Fitch's and Emmons's material probably came, it does not correspond with either the description or the figure of that species. For instance, it lacks the dorsal sagittate mark which is both described and represented in the figure of *cinereus* (Nat. Hist., N. Y., Agri. V, Plate XIII, Fig. 7), and in comparison with the outline there given has a much greater pronotal arcuation. There seems to be no other described species to which it may be referred, and it is therefore presented as new.

Cyrtolobus rufulus new species.

The following new species, as its name implies, is a reddish one, founded on a few female examples taken in Alabama, of less than medium size with rather low pronotum, notable in having its anterior half a lighter shade of red than the posterior half, the division along the line of an oblique vitta which is absent, as are all other markings. However in the specimen chosen as holotype and figured herewith the oblique vitta is indicated not only by

the abrupt transition from one shade of red to the other, but by a distinct thinning of the red wash on the yellowish ground color of that region, particularly on its lower half. Another outstanding character of these specimens is the strong triangular maculation of the middle of the fore wings, preceded by a pinkish wash, in this respect recalling *pallidifrontis* Emmons as here recognized. But the legs are always wholly pale, lacking the shining black of the femora above, so characteristic of that species in both sexes. At the same locality numerous pinkish specimens were taken of similar form, though seeming to average a little smaller, with both anterior oblique and anteapical vittæ present, frequently outlined with black, as well as with a distinct mid-dorsal pellucid spot, and with fore wings quite devoid of maculation at their middle. At first I regarded these as distinct from the above; but a considerable series seems to show every gradation between the two forms, including vittate specimens with maculate fore wings, and those with the vittæ obsolete and the fore wings clear at their middle. No structural character has been discovered by me by which they may be specifically separated, and I am constrained to regard them as one. The description of the selected types of both sexes follows, their figures being appended hereto.

Cyrtolobus rufulus, new species. (Plate III, Figs. 19, 20.)

FEMALE: Under medium in size, arch low, surface with a smooth appearance due to its unusually small even punctures; reddish, darker on posterior half; in holotype without vittæ or mid-dorsal translucent spot, and with fore wings triangularly maculate at middle.

Face yellowish, strongly suffused with red; clypeus little produced, rather broad and moderately incurved, its yellowish ground color also washed with red, but less strongly.

Metopidium hardly receding from plane of face till level with top of humeri; thence pronotum retreats almost horizontally to above post-humeral sinus in holotype, and then rises again, the rise being more gradual in most specimens from top of metopidium to low summit back of post-humeral sinus, thence unevenly sloping downward, with sinuations at positions of mid-dorsal translucent spot and anteapical vitta, both lacking, to tip, which attains middle of terminal areole of fore wings. Anterior half of pronotum overspread with dull red back to position of an oblique vitta, in the holotype that vitta indicated by a broad triangular yellowish spot at lateral margin, and supra-humeral bands by obscure subtending pale lines; the whole posterior half rich mahogany red without pattern, but with a moderate mid-dorsal compression.

Body beneath yellowish testaceous, sides of abdomen encarnadined.

Fore wings marked with blackish brown clouds at base, middle and tip, that at middle broadly triangular preceded by a pinkish area, that at tip rather round, covering terminal areole and apical third of cell above it.

Legs wholly yellowish testaceous.

Length 5.60 mm.

MALE: Smaller and much lower than the female, though still distinctly arched; vittæ present.

Face and anterior half of pronotum suffused with red as in the female.

Metopidium with supra-humeral bands more evident, but obscure, the surface above and sides of pronotum anterior to oblique vitta more or less mottled with numerous small black areas, the triangular pale area at lateral margin evidencing the oblique vitta whitish instead of yellowish, its summit indicated by a pale spot on carina Mid-dorsal pellucid spot obscure except on carina, the compression moderately deep, and the anteapical vitta white, vertical, broad; very narrowly bordered anteriorly with black, before which the pronotum is bright red. Tip brownish red, a little exceeding the angular base of terminal areole of fore wings.

Body beneath testaceous with more or less black anteriorly and on sutures, abdominal segments on sides black bordered with red, genital plate with tip and styles black.

Fore wings maculate as in female, but much less heavily at middle.

Legs wholly pale.

Length 5 mm.

Holotype ♀. Hazen, Ala. IV/2/'21. Taken on *Quercus alba.*

Allotype ♂. Same locality. V/2/'23. Taken on *Quercus minor.* Both in my collection.

Paratypes: Same locality. Several males and females, in all about fifty, a great majority of which are those with vittæ prominently present, are before me; and if, as I believe, they are all of the same species, they may be regarded as paratypes.

Were I challenged with respect to assigning the above male to the holotype as of the same species, my excuse would be the lame one that similar males were taken commonly with the corresponding vittate females at the same place, though not noted in copulation, and that it looks as though it belonged with it. In the absence of proof to the contrary, I regard the presumption sufficiently great to warrant my so assigning it. But the real difficulty is presented by those females that have the vittæ and mid-dorsal pellucid spot fully developed. Where the vittæ are outlined with black, as often occurs, I find considerable trouble

in pointing out characters to distinguish them from certain females of *gramatanus* Woodruff (ante), the seemingly constant presence of the middle cloud in the fore wings of the latter not being sufficiently diagnostic, as such a cloud is often present or indicated here. It is true that this southern species is a pinkish red insect even when patterned like the northern more grayish *gramatanus,* and compared with specimens of the latter from its type locality seems to average lower, longer with less contrast between color of pronotum before and behind middle, the anterior oblique vitta usually sharply angulated at its middle when considered from its front margin instead of actually interrupted there as in *gramatanus,* which latter seems to present a larger and more conspicuous mid-dorsal translucent spot. Yet specimens are found in which these slight differences tend to disappear; and were it not that the non-vittate forms, with which these seem to merge, are so thoroughly unlike *gramatanus,* I would hesitate to separate them from that species. In order to exemplify what seems to be the range of variation in the species at its type locality I append figures of another specimen of each sex (Figs. 17, 18) which will show the approach toward *gramatanus* above noted. Descriptions of these follow:

FEMALE: Face reddish yellow, punctures of frons black.

Metopidium at base and on central third to summit testaceous yellow, centrally with black punctures. Sides of metopidium reddish yellow, with broad deeper red bands from callosities above eyes running up over humeri. Between humeri and anterior oblique vitta testaceous heavily mottled with black, that vitta testaceous white, arising from before middle of lateral margin, broad at origin, vertical to a point close to anterior lower angle of broad squarish mid-dorsal translucent spot, thence narrowly and irregularly forward, and again rising and expanding on summit of crest over post-humeral sinus. This vitta is bordered posteriorly with black, back of which the pronotum is an even rich dark red interrupted by the vertical white anteapical vitta, which expands forward on crest and is bordered before and broadly behind with black. Tip testaceous.

Body beneath black anterior to abdomen, otherwise reddish testaceous.

Fore wings slightly enfumed, fuscous at base, on veins at middle, with rounded terminal cloud covering the terminal areole and apex of cell above it, but not extending up along margin.

Legs pale.

Length 5.5 mm.

MALE: Like the female above described, but smaller.

Pronotum with anterior oblique vitta at summit of crest, and mid-dorsal translucent spot, much reduced; black borders of anteapical vitta obsolete, tip wholly red.

Fore wings with pronounced triangular cloud at middle; often almost or quite devoid of it. Terminal cloud as in the female but darker, in a series very variable in extent and definition.

Legs pale; basal portion of femora in front (not above) with a more or less continuous and broad brownish stripe, often lacking.

Length 4.80 mm.

These were taken at the type locality IV/9/'21 and V/5/'23 respectively, and are in my collection, there distinguished as "form *ornatulus*" from the typical non-vittate form. The pronotal sinuation of both figures of the female presented is individual, though the species has a tendency toward it at those parts of the carina usually marked with pale; most specimens showing an even arc to tip.

In addition to the material from the type locality I have examined several specimens from New Jersey, Staten Island and Long Island, N. Y., one female from Ocean Sp., Miss. (Funkhouser Coll.), and one bearing label "Topeka Ks. Popinoe", one from Louisiana and a pair from Texas in the United States National Museum. Extensive material from Illinois, Wisconsin, Minnesota and S. Dakota has also been seen, which I range with this species, though with some hesitation. If correctly placed, it would appear that northern specimens average somewhat larger and less pinkish than those from the south.

This group, consisting of *griseus* Van D., *pallidifrontis* Emm., *gramatanus* Woodr., and *rufulus* Woodr., presents more difficulties than any other in the genus. Typically the species are severally abundantly distinct; but specimens are continually coming to hand which combine in bewildering fashion the characteristics in pattern, size, color, etc., of two or more of them, so that their recognition is problematic. In all the structure of clypeus and pronotum, as well as the pattern, is very similar, and the fine punctures of their surfaces give the effect of a sheen which is distinctive, not of one species, but of the group. In fact we have here a marked instance of the condition of the family as a whole,

the several genera made up of numerous forms whose characters seem to be somewhat in a state of flux. As classification has as its purpose not only the expression of such relationships as we find in nature, but also a terminology which we may conveniently use in the study of these several forms, the best we can do here is to recognize as so-called species those which exhibit outstanding differences, and grade those with them which seem to approach them most closely, bearing in mind as checks both locality of capture and host plant.

Cyrtolobus fuscipennis Van Duzee.

In *Cyrtolobus fuscipennis* Van Duzee we find an extraordinary range of color, particularly in the female, where the gamut runs from very dark red thickly overlaid with black, but not obscuring the vittæ, to pale whitish and creamy examples with the markings obsolete. In all phases of both sexes, however, in addition to the smoky wings, a somewhat variable though distinctive character, the tip of the pronotum behind the anteapical vitta seems to be almost always red in some degree, furnishing a fairly good specific mark in this otherwise well characterized species. The male has not heretofore been described. A figure of a specimen of that sex is hereto appended, and its description follows:

Cyrtolobus fuscipennis Van Duzee. (Plate VI, Fig. 49.)

MALE: Face crimson red. Clypeus narrow, produced below genæ.

Metopidium very dark brown overlaid with black. Pronotum low, highest at mid-dorsal translucent spot, the anterior border of which slopes almost parallel with anterior oblique vitta; color dark red, including tip. Anterior vitta angulated caudad at its middle, broad, dull white, broadly bordered in front and behind with black, as is the broad, white and vertical anteapical vitta.

Body beneath black.

Fore wings far exceeding pronotum, dark smoky, very broadly and darkly infuscated at apex, the cloud covering terminal areole and half of adjacent cells.

Legs pale, femora above black.

Length 5.50 mm.

Allotype ♂. Litchfield, Conn. VI/9/'21. In my collection. Taken on *Quercus alba.*

Of this species I have been fortunate in taking many pairs in copulation. As stated above, its pigmentation is subject to great variation, specimens of the female frequently showing no trace of black, being wholly red, or brown, or pale, with however the usual vittæ. The anterior margin of the terminal cloud of the fore wings is usually sharply defined in a straight forward tilted line, against which they present their clearest area.

Cyrtolobus togatus new species.

The following new species is a pretty little pink and yellowish one, and seems to be fairly common in the type locality (Hazen, Ala.), where it is associated with willow oak, doubtless as its preferred host plant. I have found it in great abundance on that tree, and believe that the few found on other species of oak are flown specimens. Figures of the holotype and allotype are appended hereto, and their description follows:

Cyrtolobus togatus, new species. (Plate V, Figs. 35, 36.)

FEMALE: Small, slender, little elevated, pronotum highest back of post-humeral sinus; punctuation rather fine, moderately shining with somewhat silky or oily sheen.

Face greenish with black punctures; clypeal sutures, margins of loræ and genæ, and erect band adjacent to eyes, roseous. In many specimens this rosy wash is lacking, the black punctures furnishing the pattern. Clypeus produced, incurved. Eyes rosy.

Pronotum attains basal angle of terminal areole of fore wings. Green of face and bands adjacent to eyes continued on base of metopidium. A broad light yellow band rises from greenish base of metopidium at the middle to the slightly indicated carinal sinus at its summit, its margins parallel from front view, continued thence diagonally to mid-lateral margin of pronotum, in most specimens at hand bordering a narrow, irregular whitish anterior oblique vitta. Two broad pinkish rufous bands, arising at callosites of metopidium over eyes, border the central yellowish band, crossing over the humeri, where they become lost, or in some examples continuing rearward, indefinitely overspreading the yellowish area anterior to the oblique vitta. A narrow yellow marginal band from base of metopidium includes the humerus and post-humeral sinus and merges in the yellowish area forward of the anterior vitta. Carina yellow from base of metopidium to vague anterior sinus, thence narrowly dark to near acute apex, but interrupted by pale of mid-dorsal translucent spot and anteapical vitta. Pronotum darker rufous back of indicated oblique vitta, the latter obsolete in the holotype, but its position indicated by contrasting colors of pronotum

before and behind it. Mid-dorsal translucent spot squarish. That and anteapical vitta not strongly defined.

Body beneath green.

Fore wings hyaline, rufous at base, apex with dark cloud covering terminal areole; veins pale.

Legs pale testaceous.

Length 4.50 mm.

MALE: Like the female in size and form, but coloring much more pronounced.

Face yellowish testaceous almost wholly concealed by dark rufous.

Pronotum bright chestnut brown usually, in allotype and occasional specimens black, the chestnut brown discernible at the edges of the vittæ, with yellowish white as follows: Carina on metopidium from base to anterior sinus; broadly over humeri along lateral margin to junction with anterior oblique vitta back of middle; that vitta broad at lateral margin, rising toward anterior sinus but extending but little more than half way; mid-dorsal translucent spot varying much in size and definition, in allotype small but distinct. Anteapical vitta rising vertically, distinct and parallel-sided in allotype, usually broadening at summit.

Body beneath and abdominal ventral segments black.

Fore wings hyaline, base and veins dark chestnut red; apical cloud black, squared anteriorly.

Legs pale testaceous, femora above blackish on basal two-thirds.

Length 4.50 mm.

Holotype ♀. Hazen, Ala. IV/13/'21. Taken on *Quercus phellos.*

Allotype ♂. Same locality date and host plant. Both in my collection.

Paratypes: Fourteen males and twenty-three females, all taken by me at the type locality in the spring of 1921 and 1923, may properly be regarded as paratypes.

The holotype and allotype were taken by me in copulation, and all were taken by beating *Quercus phellos* except two, which were found on *Quercus minor.* In the large amount of material which has passed through my hands I have seen no examples from any other State than Alabama except a pair from Louisiana in the collection of the National Museum; but doubtless it will be found throughout the south wherever *Quercus phellos* occurs in abundance.

The coloring of the females is not sharply contrasted, the roseous and yellowish shades of the pronotum tending to merge into a unicolorous tint. But the broad rufous bands over the

shoulders are quite conspicuous and constant, and offer a good diagnostic mark.

Cyrtolobus flavolatus new species.

Only four specimens of the following very distinct little species have been seen by me, three taken by Mrs. A. T. Slosson in Pennsylvania, and one by Mr. Davis on Long Island, N. Y. It is a small reddish brown and yellow form, with low pronotum, strongly suggesting in its markings *Ophiderma flavicephala* Goding, but in structure a member of this genus. Figures of both sexes are appended hereto, and their description follows:

Cyrtolobus flavolatus, new species. (Plate V, Figs. 37, 38.)

FEMALE: Face pale yellow, broader between eyes than long, clypeal sutures distinct, clypeus convex between loræ and produced below.

Pronotum low, sparsely hairy; carina on metopidium distinct, rising very moderately from anterior sinus, highest about middle, sloping evenly to apex, which barely reaches as far back as basal angle of terminal areole of fore wings. Mid-dorsal compression rather deep. Color light reddish brown, with yellow distributed as follows: Base of metopidium narrowly margined with yellow, this color rising at its middle in a band as broad as distance between ocelli to its summit, and extending over humeri in broad and slightly widening bands along lateral margins two-thirds the length of pronotum, their apical extremities arcuated abruptly from just below mid-dorsal compression to lateral margins. The usual anteapical vitta also yellow, narrow, descending slightly caudad. No trace of an anterior oblique vitta.

Body beneath pale yellow.

Fore wings reddish at extreme base, narrowly pale fuscous at terminal margin, the fuscous cloud slightly invading apical cells, veins pale testaceous. Otherwise hyaline.

Legs pale yellow.

Length 5.5 mm.

MALE: Like the female, but even more depressed; colors brighter, more sharply contrasted.

Pronotum a darker reddish brown, marked with yellow as in female, the callosities on metopidium above eyes conspicuously black.

Body beneath, and apex of clypeus and loræ, black.

Fore wings like those of female, but veins and cloud much darker, the fuscous margin covering about half of terminal areole.

Legs pale, fore femora above a little brownish.

Length 5. mm.

Holotype ♀. Delaware Water Gap, Penn. VII/1/—(Mrs. Slosson). In collection of Mrs. A. T. Slosson.

Allotype ♂. Same locality. No date label. (Mrs. Slosson.) Also in Slosson collection.

Paratype ♂. Same locality. No date label. (Mrs. Slosson.) in my collection, and ♀ from Half Way Hollow Hills, Long Isand, N. Y. VII/2/'15. (W. T. Davis.)

The depressed form of this species, particularly in the male, suggests the genus *Ophiderma,* but the strong carination and the compression of the pronotum posteriorly characterize it as a *Cyrtolobus.* Although I have sought for it in the type locality, as well as in the exceedingly large amount of material which has passed through my hands, the above specimens are all that I have seen. The female (holotype) bore the label *"Cyrtolobus lateralis* V. D. var.?". But it is not close to *lateralis* Van Duzee. While marked somewhat as in that species, these specimens are hardly a quarter of its size in bulk, and the fore wings are clear, while those of *lateralis* are conspicuously clouded throughout with dark smoky. Besides, *lateralis* was assigned by Van Duzee to *Xantholobus,* in which sub-genus I think it belongs, whereas this little species is excluded from that sub-genus by the lack of bulbous inflations fore and aft of the mid-dorsal compression, the pronotum tapering evenly to apex with hardly a suggestion of cysts. It is unquestionably entitled to specific recognition.

Cyrtolobus inermis Emmons.

This is here referred to for the purpose of calling attention to the fact that there seem to be two color forms of the male—the polished black one, described by Van Duzee in his "Studies", and a light brown one with like white vittæ. There is also apt to be present in both black and brown forms a small mid-dorsal translucent spot. It is just possible that the black form indicates greater maturity; but of that there is no evidence. Apparently these color phases parallel those in the male of *C. ovatus* Van D., before referred to.

Cyrtolobus (*Atymna*) *simplex* Van Duzee.

So far as known to me, the male of this species has not yet been found and recorded. Its habitat is in our southwestern

states, and a report of the capture of a copulating pair is very desirable, that this gap in our knowledge of the group may be definitely filled.

Cyrotolobus (*Atymna*) *castaneae* Fitch.

This opportunity is availed of to record my conviction, based upon material which I have collected, that *viridis* Emmons as described and figured by him, and which still holds a place in our List, is certainly one of the color forms of *castaneæ* Fitch, as has been suggested by other authors. With the practical annihilation of our chestnut trees the future persistence of this species is problematical, although it does at times subsist on oaks.

Cyrtolobus (*Atymna*) *helena* Woodruff.

This species, described in the Journal of the New York Entomological Society, XXIII, p. 44, Plate IV (1915), was found in comparative abundance on *Quercus platanoides* (*bicolor*) at Bronxville, N. Y. Although still to be found on its host plant at that locality, no example that has been taken elsewhere has been seen by me except from New Jersey, and the following two: A male taken by Dr. H. H. Knight in Ramsey Co., Minn., July 20, 1920, and a female, also taken by him at Faribault, Minn., June 12, 1922. These two specimens are typical, having been compared by me with holotype and allotype respectively, except that the female has very interesting sub-obsolete indications on the crest of the dark markings of the male; and their capture in a State so far distant from their type locality makes it probable that the species will subsequently be found upon its favored host plant throughout our northeastern states.

It has been suggested that this species does not belong in *Atymna,* the summit of the crest being back of the humeri as in *Cyrtolobus s. str.* Notwithstanding the force of that suggestion, I still regard its position in the genus as very close to *Atymna querci* Fitch, with the two sexes of which it closely corresponds in general coloring and form. It may be pointed out that, except in *Atymna castaneæ,* the form of the pronotal arch of the female in the several species generally assigned to this sub-genus in order to indicate their affinities in the group, tends to conform with that

found in *Cyrtolobus* proper; the females of all of the species so assigned being green and without pattern, though in *castaneæ* ranging from that color to almost black. The slightly more rearward summit of the pronotum in the male of *helena* is in my opinion not sufficiently important to warrant the ignoring of the many other correspondences which point to its alignment in classification with the special group which includes *A. querci* Fitch.

Cyrtolobus (*Atymna*) *querci* Fitch.

In this common species color variation in the males is of frequent occurrence. Copulating examples of this sex in some sections are regularly pink and yellow, instead of the more typical black and yellow; the pattern, however, continuing normal.

Cyrtolobus (*Atymna*) *inornata* Say.

This distinct little species, one of the first in the genus to be described, is remarkable in having the two sexes alike in coloring, both green. No satisfactory character has yet been pointed out for distinguishing the female from the corresponding sex of *querci* Fitch, and though it most probably averages smaller, I suspect that the two species are commonly confused in collections, including my own, except in those cases where the females have been taken in copulation.

Cyrtolobus (*Evashmedea*) *concinnus* Goding.

This dorsally sinuate and elongate species is another of our southwestern forms, concerning which there seems to be no confusion.

Cyrtolobus (*Xantholobus*) *muticus* Fab.

This is a widespread species of our eastern and southern states, which is generally recognized. No occasion for its discussion here is present.

Cyrtolobus (*Xantholobus*) *lateralis* Van Duzee.

The species *Cyrtolobus* (*Xantholobus*) *lateralis* Van Duzee was based upon one female taken at Ithaca, N. Y., and well described in the "Studies" (ante). As the male has not been recognized in

the literature, a figure of an example of that sex is here presented, together with a description.

Cyrtolobus (*Xantholobus*) **lateralis** Van Duzee. (Plate VI, Fig. 50.)

MALE: In form like the female, but a little smaller, the swollen posterior cyst very characteristic.

Face black, heavily marked with yellowish testaceous, including clypeus above its inflexed process.

Pronotum jet black, base of metopidium yellowish testaceous, lateral margins to below posterior cyst, as in the described female, and broad vertical anteapical vitta, testaceous white.

Body beneath black.

Fore wings on basal half and broadly at apex dark fuscous, including veins; otherwise smoky hyaline, not nearly so enfumed as in the female.

Legs pale, femora above black.

Length 5.75 mm.

Allotype ♂. Litchfield, Conn. VI/22/'22. Taken on *Quercus alba*. In my collection.

I have taken but one other male, in the same locality, which is the counterpart of the one above described. A considerable series of females shows a gradation in pronotal coloring from pale rufous brown to very deep mahogany red, almost black, and a frequent abbreviation of the pale lateral margin to a narrow border not extending rearward beyond the post-humeral sinus, and occasionally wholly obsolete. The anteapical vitta, present in the male, is lacking in the female. The body beneath in that sex is much the color of the pronotum; but the abdominal segments are pale except the elongated ninth (either side of styles of ovipositor), which is light rufous, as are the legs, including femora. In the "Fitch material" at the National Museum is a female of this species impaled on a short ordinary pin with a number label 3112 underlined in red ink, and a narrow name label reading *C. nigripennis*. So far as I can discover there has been no publication under this name, in which case Van Duzee's name for this species is valid.

Cyrtolobus (*Xantholobus*) *inflatus* Van Duzee.

The male of this species has not yet been described, but it is known, and I understand that the description is presently forthcoming. It is another inhabitant of our southwestern states.

Cyrtolobus (*Xantholobus*) *tumidus* Walker.

Of this species I have no personal knowledge. It was described from Florida, and Dr. Funkhouser reports it from Mississippi also.

Cyrtolobus (*Xantholobus*) *nitidus* Van Duzee.

The species *Cyrtolobus* (*Xantholobus*) *nitidus* Van Duzee was based upon three females, one taken at Lakehurst, New Jersey, and although assiduous collecting in the type locality has been done in an endeavor to discover the male, it has resulted only in the acquisition of a few more females, most of which were taken on *Quercus ilicifolia*. They are substantially counterparts of the co-type taken on Staten Island, N. Y. by Mr. W. T. Davis. What is undoubtedly the male of this species, however, is a black specimen which is described below and figured herewith, taken by Mr. Chris E. Olsen on the south shore of Long Island, N. Y., the insect fauna of which region has a decidedly southern cast. A figure of the above co-type, now in the collection of the American Museum of Natural History through the generosity of Mr. Davis, is herewith presented on Plate V, Fig. 40, and the male above referred to is also figured in Fig. 39 of that plate.

Cyrtolobus (*Xantholobus*) **nitidus** Van Duzee. Plate V, Figs. 39, 40.-

MALE: Black, low, shining, coarsely hairy, with the posterior swelling of pronotum characteristic of the sub-genus.

Face black, shining, coarsely and densely punctured, a narrow and sharp median channel from apex to clypeus, the latter strongly deflexed; a mahogany red spot at margin above each ocellus.

Pronotum black, shining, coarsely punctured, the metopidium depressed callosities lacking, but in their place smooth shining mahogany red spaces above inner corner of each eye. Mid-dorsal compression strong without translucent spot, succeeded below, and posteriorly by a pronounced bulbous swelling. Anteapical vitta white, vertical, crossing pronotum just before apex, the latter black, blunt, not reaching triangular base of terminal areole of fore wings.

Body beneath black anteriorly and on sides of abdominal segments. Otherwise pale testaceous.

Fore wings hyaline, their veins flavous, without terminal cloud, but basal three-fifths very heavily infuscated with blackish mahogany.

Legs testaceous white, the spines of posterior tibiæ and tarsi black.

Length 3.5 mm.

Allotype ♂. Bay Shore, Long Island, N. Y. VII/4-7/'12 (C. E. Olsen), in my collection.

This species is not often met with, and except for those from Lakehurst, N. J. I have seen but one female, collected at Bay Shore, Long Island, where the above male was taken, and another collected at Clayton, Georgia.

As must have been inevitable in the consideration of so difficult and confused a genus as the one under discussion, there are before me many forms which seem to be distinct and undescribed, but by reason of lack of adequate material or other cause impelling caution in determining their specific status, they are not assigned definitely for the present, and so are not considered in this paper. I have no doubt that several of them represent unrecognized species, and from my own experience think it probable that intensive collecting throughout our area will disclose many more forms hitherto undescribed.

In this group the female usually bears the more distinctive pattern, and for that reason, as well as the fact that that sex is ordinarily much the more abundant and long-lived, the several species are almost always founded upon a female specimen. Furthermore, as the males are apt to be very differently colored from the females with which they are properly associated, and at the same time similarly colored as between themselves in the several species, it is often difficult to assign correctly a specimen in hand. This renders it most important to take pairs in copulation. Their breeding season is very brief, and such pairs are found only occasionally; the several species are very local in their habits not being widespread even in a locality where found on their particular host plant in comparative abundance; and aberrant color forms occur frequently which are puzzling to place. These facts, among others, make the task of preparing a competent and exhaustive review of the genus one that requires, in our present state of knowledge, much time and intensive field study over our whole area.

When a species is recorded as rare, it should perhaps be understood as meaning rarely found. It is quite possible that some of our rarities find the inaccessible upper branches of their host plant

more to their liking than the lower ones, thus escaping observation and capture.

In my citation of paratypes I have usually indicated only such specimens as have been taken in the type locality, though reference has been made to undoubted specimens of the species under consideration taken elsewhere that have come to my attention. An effort will be made to distribute paratypes of the new species here described and discussed, when available, among the more important representative collections in the country.

EXPLANATION OF PLATES I TO VI.

All figures are enlarged eight diameters.

PLATE I.

Fig. 1. *Cyrtolobus vau* Say. Male.
Fig. 2. *Cyrtolobus vau* Say. Female.
Fig. 3. *Cyrtolobus arcuatus* Emmons. Male. Allotype.
Fig. 4. *Cyrtolobus arcuatus* Emmons. Female.
Fig. 5. *Cyrtolobus dixianus* Woodruff. Male. Allotype.
Fig. 6. *Cyrtolobus dixianus* Woodruff. Female. Holotype.
Fig. 7. *Cyrtolobus auroreus* Woodruff. Male. Allotype.
Fig. 8. *Cyrtolobus auroreus* Woodruff. Female. Holotype.

PLATE II.

Fig. 9. *Cyrtolobus celsus* Van Duzee. Male. Allotype.
Fig. 10. *Cyrtolobus celsus* Van Duzee. Female.
Fig. 11. *Cyrtolobus funkhouseri* Woodruff. Male. Allotype.
Fig. 12. *Cyrtolobus funkhouseri* Woodruff. Female. Holotype.
Fig. 13. *Cyrtolobus fuliginosus* Emmons. Male. Allotype.
Fig. 14. *Cyrtolobus fuliginosus* Emmons. Female.
Fig. 15. *Cyrtolobus clarus* Woodruff. Male. Allotype.
Fig. 16. *Cyrtolobus clarus* Woodruff. Female. Holotype.

PLATE III.

Fig. 17. *Cyrtolobus rufulus* Woodruff. Male.
Fig. 18. *Cyrtolobus rufulus* Woodruff. Female.
Fig. 19. *Cyrtolobus rufulus* Woodruff. Male. Allotype.
Fig. 20. *Cyrtolobus rufulus* Woodruff. Female. Holotype.
Fig. 21. *Cyrtolobus intermedium* Emmons. Male.
Fig. 22. *Cyrtolobus intermedius* Emmons. Female.
Fig. 23. *Cyrtolobus gratiosus* Woodruff. Male. Allotype.
Fig. 24. *Cyrtolobus gratiosus* Woodruff. Female. Holotype.

PLATE IV.

Fig. 25. *Cyrtolobus pallidifrontis* Emmons. Male.
Fig. 26. *Cyrtolobus pallidifrontis* Emmons. Female.
Fig. 27. *Cyrtolobus gramatanus* Woodruff. Male. Allotype.
Fig. 28. *Cyrtolobus gramatanus* Woodruff. Female. Holotype.
Fig. 29. *Cyrtolobus pulchellus* Woodruff. Male. Allotype.
Fig. 30. *Cyrtolobus pulchellus* Woodruff. Female. Holotype.
Fig. 31. *Cyrtolobus parvulus* Woodruff. Male. Allotype.
Fig. 32. *Cyrtolobus parvulus* Woodruff. Female. Holotype.

PLATE V.

Fig. 33. *Cyrtolobus puritanus* Woodruff. Male. Allotype.
Fig. 34. *Cyrtolobus puritanus* Woodruff. Female. Holotype.
Fig. 35. *Cyrtolobus togatus* Woodruff. Male. Allotype.
Fig. 36. *Cyrtolobus togatus* Woodruff. Female. Holotype.
Fig. 37. *Cyrtolobus flavolatus* Woodruff. Male. Allotype.
Fig. 38. *Cyrtolobus flavolatus* Woodruff. Female. Holotype.
Fig. 39. *Cyrtolobus nitidus* Van Duzee. Male. Allotype.
Fig. 40. *Cyrtolobus nitidus* Van Duzee. Female. Holotype.
Fig. 41. *Cyrtolobus ovatus* Van Duzee. Male. Allotype.
Fig. 42. *Cyrtolobus maculifrontis* Emmons. Male.

PLATE VI.

Fig. 43. *Cyrtolobus fenestratus* Fitch. Male.
Fig. 44. *Cyrtolobus fenestratus* Fitch. Female.
Fig. 45. *Cyrtolobus discoidalis* Emmons. Male. Allotype.
Fig. 46. *Cyrtolobus discoidalis* Emmons. Female.
Fig. 47. *Cyrtolobus acuminatus* Woodruff. Male. Allotype.
Fig. 48. *Cyrtolobus acuminatus* Woodruff. Female. Holotype.
Fig. 49. *Cyrtolobus fuscipennis* Van Duzee. Male. Allotype.
Fig. 50. *Cyrtolobus lateralis* Van Duzee. Male. Allotype.